Lake Michigan Committee
2003 Annual Meeting
Milwaukee, Wisconsin
March 19-20, 2003

Lake Michigan Management Reports

Lake Michigan Fisheries Team
Wisconsin Department of Natural Resources

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INTRODUCTION

These reports summarize some of the major studies and stock assessment activities by the Wisconsin Department of Natural Resources on Lake Michigan during 2002. They provide specific information about the major sport and commercial fisheries, and describe trends in some of the major fish populations. The management of Lake Michigan fisheries is conducted in partnership with other state, federal, and tribal agencies, and in consultation with sport and commercial fishers. Major issues of shared concern are resolved through the Lake Michigan Committee, made up of representatives of Michigan, Indiana, Illinois, Wisconsin, and the Chippewa Ottawa Resource Authority. These reports are presented to the Lake Michigan Committee as part of Wisconsin's contribution to that shared management effort.

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FISH HEALTH UPDATE

We stock about 160,000 coho in the Kewaunee River, and in 2002, fewer than 300 fish returned to spawn. Return rates are somewhat lower than expected in the Root River, and the combined run was not sufficient to meet our egg taking needs. Fish were smaller than average (3-5 pounds each compared to 5-10 pounds typically). We were fortunate to obtain 500,000 eggs from Michigan DNR. I am concerned that we may be starting to see some type of genetic bottleneck in our coho. The 1994 yearclass experienced the highest EMS mortality (up to 90% at some hatcheries). In Wisconsin, we only stocked 100,000 coho from that yearclass (50,000 each in our two Lake Michigan weirs). Although we water harden our coho eggs in thiamine and do not lose many fry at all to EMS, I am concerned that we are losing some genetic material in each generation. Adults returning to the Kewaunee River have not contributed significant genetic material in the past few years due to poor return rates. What effect this may have at the population level is unknown, but I would like to bring this forward to the Lake Michigan Committee to see if this could be a problem, and if it is, what can be done to solve it.

In 2000 and 2001 we experienced higher than expected prevalences of the causative agent of furunculosis, *Aeromonas salmonicida* (about 23% each year) in returning coho spawners at both the Root River and Kewaunee River weirs. In 2002, prevalence was lower, but was still the predominant bacterium cultured. Our observations of increased prevalence of *A. sal.* prompted me to collaborate with Dr. Hui-Min Hsu and her supervisor Dr. Ogi Okwumabua on a proposal to look at the virulence genes and other molecular characteristics of the bacterium. Our thought is to find out if bacterial isolates from the Great Lakes are different than those from hatchery fish, and whether this may explain the higher prevalences we see in the coho, or perhaps suggest a reason so few coho return to the Kewaunee weir now compared to 5-10 years ago. We submitted our pre-proposal to the GLFC. If the proposal is funded, we would solicit *A. sal.* isolates (from feral spawners as well as hatchery production fish) from all GLFHC members. We hope to obtain about 50 isolates for this study.

We continue to water harden coho, chinook, steelhead and seeforellen brown trout eggs in 750 ppm thiamine at a pH of 7.2-7.4 for at least 2 hours (or until fully water hardened). We do not see much swim up mortality.

Our INAD for erythromycin has expired. Michigan, Indiana, Illinois, Pennsylvania and the USFWS have not treated fish for many years, so this will not be a bitter pill to swallow. The only fish we continued to treat were coho small fingerlings. This year we will try feeding EWOS' BOOST feed for three weeks during the same period we would normally treat with erythromycin. We will monitor *R.s.* before the treatment using kidney smear DFAT, and in the Fall and following Spring before fish are stocked by the same method. It is my hope we can manage around BKD by feeding diets such as EWOS' BOOST which contains nucleotides and glucans that supposedly enhance the immune system. The feed is fed for three weeks before an anticipated stressful time (such as fin clipping, handling, etc.) and can be fed after the stress as well.

We continue to collaborate with Ron Pascho and Diane Elliott of the Western Fisheries Research Center in Seattle Washington on studies related to Bacterial Kidney Disease in chinook. We have provided chinook eggs from Root River parents that tested negative for BKD. Progeny were exposed to *Renibacterium salmoninarum* and the fish were sampled after infection to see how the immune system responded. This information will be used to develop more effective vaccines for controlling BKD. As an interesting aside, the researchers observed that the overall mortality rate for Root River chinook was consistently lower that West Coast chinook (two different strains). They are very interested in whether this tolerance for BKD is a heritable characteristic. The Root River chinook are offspring of Strawberry Creek parents. Throughout the period of chinook epizootics in Lake Michigan (1988-1995) we maintained our egg take at Strawberry Creek and did not stock New York strain chinook there. So perhaps it is not too surprising that our fish developed tolerance to the bacterium. Ironically, based on *R.s.* cultured by the USGS fish health lab in Leetown, WV in 1990/91, and used for virulence studies by that lab, Lake Michigan bacterial isolates appear to be more virulent (capable of causing disease and death) than other isolates from the West and East Coasts. Dr. Mohamed Faisal (University of Michigan) is interested in pursuing this and has started doing some genetics work with *R.s.* isolates from Lake Michigan.

We also collaborate with Dr. Dan Sutherland at UW La Crosse on research related to Heterosporis, a new microsporidan parasite that infects the muscle of yellow perch and a surprising diversity of other fish species. Lab studies funded by WI and MN DNRs showed that rainbow trout, channel catfish, fathead minnow, and walleye are all good hosts for the parasite; largemouth bass and bluegill could be infected, but the parasite did not spread throughout the fish muscle. At present, Dr. Sutherland received funding from the GLFC to continue these studies, including the role of piscivorous birds in the transmission of Heterosporis, what disinfection methods effectively kill the spores, what other Great Lakes species are susceptible to the parasite, and what role temperature plays in the completion of the parasite’s life cycle.

It is good to see so much interest in fish health issues, especially reflected in the research topics from which recent proposals have been solicited from the GLFC and Great Lakes Fishery Trust. If there are funds, they will come.

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SPORT-FISHING EFFORT AND HARVEST

Open-water fishing effort was 2,945,848 hours during 2002, 8% above the five-year average of 2,717,456 (Table 1). The shore and pier fisheries had a strong increase for the second consecutive year after a long-term downward trend in effort. The moored-boat fishery also showed increased angler effort over 2000 and 2001, but was still 14 % below the five-year average. The ramp fishery increased 12 %, while charter and stream effort were about average.

Wisconsin anglers had an excellent salmonid fishery during 2002. Trout and salmon harvest was 401,207, 31 % above the five-year average (Tables 2-4). Coho and chinook salmon harvest showed the largest increases. Coho harvest was 31 % above the 5-year mean, and the chinook harvest was 83% above the 5-year mean, and the highest recorded since 1987.

The estimated open-water harvest of yellow perch was 242,309 fish, a decrease from the last few years (Table 2). In recent years, the yellow perch harvest has been supported almost entirely by the 1998 yearclass. As the aging 1998s decline in abundance, yellow perch harvest will likely continue to decline in the near future. Walleye harvest was estimated at 16,039, while smallmouth bass and northern pike harvests were 18,561 and 1,868, respectively.

Table 1. Fishing effort (angler hours) by various angler groups in Wisconsin waters of Lake Michigan and Green Bay during 2002 and percent change from the 5-year average.

	RAMP	MOORED	CHARTER	PIER	SHORE	STREAM	TOTAL
effort (hours)	1,500,327	363,399	239,649	205,258	267,930	369,285	2,945,848
% change	+ 12%	- 14%	+ 4%	+ 43%	+ 28%	+ 1%	+ 8%

Table 2. Sport harvest by fishery type and species for Wisconsin waters of Lake Michigan and Green Bay during 2002.

SPECIES	RAMP	MOORED	CHARTER	PIER	SHORE	STREAM	TOTAL
Coho salmon	49,058	19,745	26,924	1,548	1,790	3,248	102,313
Chinook salmon	119,196	55,302	53,959	3,587	9,343	34,067	275,454
Rainbow trout	35,000	20,007	13,309	1,223	540	3,952	74,031
Brown trout	15,266	3,086	2,353	4,183	8,305	2,027	35,220
Brook trout	0	0	8	12	97	27	144
Lake trout	17,721	11,954	10,078	76	36	0	39,865
Northern pike	1,660	-	-	14	149	45	1,868
Smallmouth bass	5,840	8,184	-	2,024	2,173	340	18,561
Yellow perch	165,367	26,378	-	20,304	18,485	11,775	242,309
Walleye	10,059	618	-	3,297	15	2,050	16,039
TOTAL	419,167	145,274	106,631	36,268	40,933	57,531	805,804

Table 3. Trout and salmon harvest by species in Wisconsin waters of Lake Michigan during 1986-2002

Species	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Brook Trout	4,587	1,369	5,148	2,192	5,927	1,659	4,431	1,967	7,481	1,914	419	299	159	574	199	263	144
Brown Trout	68,806	82,397	59,397	55,036	45,092	59,164	51,554	64,546	52,397	49,654	38,093	43,224	27,371	37,187	41,111	26,421	35,220
Rainbow Trout	26,483	56,055	60,860	87,987	51,711	67,877	79,525	104,769	114,776	117,508	77,099	94,470	110,888	84,248	72,278	72,854	74,031
Chinook Salmon	356,900	396,478	176,294	189,251	111,345	139,080	103,564	87,365	99,755	162,888	183,254	130,152	136,653	157,934	136,986	191,378	275,454
Coho Salmon	127,919	111,886	136,695	105,224	64,083	44,195	70,876	74,304	110,001	65,647	104,715	138,423	59,203	56,297	88,203	47,474	102,313
Lake Trout	96,858	113,930	89,227	94,614	75,177	85,841	52,853	61,123	53,989	69,332	36,849	57,954	82,247	39,819	31,360	40,408	39,865
TOTAL	681,553	762,115	527,621	534,304	353,335	397,816	362,803	394,074	438,399	466,943	440,429	464,522	416,521	376,059	370,137	378,798	527,027

Table 4. Trout and salmon harvest by angler group in Wisconsin waters of Lake Michigan during 1986-2002

Fisheries Type	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Ramp	255,559	266,036	222,428	173,224	118,439	150,840	111,260	145,689	167,388	193,752	176,085	190,976	155,953	141,903	171,767	156,470	236,241
Moored	186,611	225,586	98,908	184,011	97,206	103,633	111,441	110,507	134,315	128,743	125,017	129,332	141,538	100,078	68,872	85,435	110,094
Charter	124,282	150,249	133,861	125,969	85,773	88,490	71,113	81,490	81,909	84,898	86,346	94,556	84,867	73,622	91,665	76,868	106,631
Pier	47,643	44,280	26,527	7,548	6,946	8,701	10,867	9,144	15,130	14,621	6,218	5,002	4,200	4,614	4,402	7,327	10,629
Shore	27,947	30,043	22,945	13,268	14,538	16,830	16,602	13,645	16,370	17,676	19,676	16,726	8,997	12,685	13,971	18,308	20,111
Stream	39,511	45,921	22,952	30,284	30,433	29,322	41,520	33,599	23,287	27,253	27,087	27,930	20,966	43,157	19,460	34,390	43,321
TOTAL	681,553	762,115	527,621	534,304	353,335	397,816	362,803	394,074	438,399	466,943	440,429	464,522	416,521	376,059	370,137	378,798	527,027

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WEIR HARVEST

The Wisconsin Department of Natural Resources (WDNR) operates three salmonid egg collection stations on Lake Michigan tributaries. The Strawberry Creek Weir (SCW) which has been in operation since the early 1970's, is located on Strawberry Creek in Door County near Sturgeon Bay and is the primary facility for chinook salmon *Oncorhynchus tshawytscha*. The Buzz Besadny Anadromous Fisheries Facility (BAFF) has been in operation since 1990 and is located on the Kewaunee River in Kewaunee County near Kewaunee. BAFF is a primary egg collection station for three strains of steelhead *O. mykiss*, coho salmon *O. kisutch*, and brown trout *Salmo trutta*. BAFF also serves as a backup for chinook salmon egg collection. The Root River Steelhead facility (RRSF) has been in operation since 1994 and is located on the Root River in Racine County in Racine. RRSF is a primary egg collection station for the three strains of steelhead, and serves as a backup for coho and chinook salmon egg collection.

Strawberry Creek is a rather small creek with no public land above the SCW. As a result all fish returning to SCW are harvested. Surplus eggs are sold under contract to a bait dealer and salmon carcasses are removed. The Kewaunee River is a rather large tributary to Lake Michigan and there is a considerable amount of public frontage below and above the BAFF. As a result salmonids captured at BAFF but not needed for hatchery egg production are released for the sport stream fishery. A large sport stream fishery has developed on the Root River, and salmonids captured at the RRSF but not needed for hatchery egg production are also released.

Salmonid egg harvest quotas vary from one year to the next based on projections to satisfy WDNR hatchery needs and accommodate egg requests from other agencies. In 2002 the projected salmonid egg quotas were: 3.8 million chinook salmon eggs, 2.0 million coho salmon eggs, 1.5 million steelhead eggs, and 0.8 million seeforellen brown trout eggs.

Low Stream flow and low Lake Michigan water level was a potential problem for chinook harvest at SCW again in the fall of 2002. However, the 3,500 foot pipeline and pump capable of pumping approximately 1,500 gallons of water per minute, that was installed in the early fall of 2000 was utilized again during fall 2002. This pump and pipeline delivered water to Strawberry Creek above the SCW and created an artificial flow sufficient for attracting and harvesting chinook. As a result SCW was able to operate despite the low water conditions and the entire chinook salmon egg quota was collected at SCW in 2002. During the fall of 2002, 11,027 chinook salmon weighing an estimated 160,994 pounds were processed at SCW (Table 1). This was a record harvest (number and weight) despite the low stream flow and low Lake Michigan lake level.

Table 1. Yearly summary of chinook salmon returns and egg collection at Strawberry Creek, 1981 through 2002.

Harvest Year	Total number of Live and Dead fish	Number of adipose clipped fish	Total Weight (pounds)	Hatchery Egg Production[1]	
				Number	Pounds
1981	4,314	-	74,209	9,786,000	9,786
1982	3,963	-	60,206	7,728,000	7,728
1983	3,852	48	66,091	6,954,000	6,954
1984	5,208	64	76,905	7,652,000	7,652
1985	5,601	582	90,860	7,085,000	7,058
1986	4,392	322	53,700	5,052,000	5,052
1987	7,624	701	99,100	4,929,000	4,929
1988	3,477	408	43,645	3,997,000	3,997
1989	1,845	301	20,849[2]	1,350,000	1,350
1990	3,016	501	47,091[2]	2,378,000	2,378
1991	3,009	377	43,630[2]	1,649,000	1,649
1992	4,099	382	51,878[2]	1,677,100	1,677
1993	4,377	582	66,094[2]	2,156,666	2,156
1994	4,051	733	63,195[2]	3,426,026	3,426
1995	2,381	408	30,001[2]	2,221,446	2,221
1996	6,653	1,185	97,134[2]	4,720,000	4,720
1997	4,850	969	78,085[2]	4,060,944	4,606
1998	5,035	1,092	61,427[2]	3,489,144	3,489
1999[3]	1,934	535	21,081[2]	633,000	633
2000[4]	6,649	2,201	75,400[2]	3,672,771	3,673
2001[4]	8,125	2,566	119,438[2]	3,775,982	3,776
2002[4]	11,027	3,678	160,994[2]	3,820,396	3,820

1 Chinook salmon eggs harvested for hatchery production (does not include eggs sold for bait).
2 Annual average weight per fish used to estimate total weight (2002 average weight was 14.6 pounds).
3 During 1999 extreme low flow conditions persisted throughout the summer and fall in Strawberry Creek, and these conditions are known to have limited the ability of chinook to return to the weir. All values for 1999 were affected by these low flow conditions.
4 During 2000, 2001, and 2002 extreme low stream flow and low lake levels persisted. A pipeline was installed which delivered approximately 1500 gallons of water per minute, and allowed weir operation.

The chinook salmon return to BAFF during the fall of 2002 was a record of 6,224 (Table 2). No chinook salmon eggs were collected at BAFF in the fall of 2002 as the full chinook egg quota was collected at the primary chinook facility (SCW). Chinook salmon with adipose fin clips, indicating that they were part of a coded wire tag study, and those fish that were in poor enough condition that recovery was unlikely were not passed upstream when captured.

Table 2. Yearly summary of chinook salmon returns and egg collection at the Besadny Anadromous Fisheries Facility, 1990 through 2002.

Year	Number of fish harvested	Number of fish passed upstream	Dead fish	Total number of fish examined	Adipose clipped	Number of eggs harvested
1990	1,307	1,797		3,104	214	1,081,000
1991	2,390	966		3,356	21	1,880,000
1992	2,254	995	625	3,874	120	2,148,000
1993	2,180	726	354	3,260	241	880,000
1994	813	847	62	1,722	452	471,000
1995	1,182	1,362	77	2,621	737	1,360,000
1996	952	2,029	212	3,193	629	700,000
1997	144	1,139	235	1,518	148	0
1998	695	2,858	452	4,005	72	1,155,080
1999	1,803	3,189	806	5,798	496	3,291,346
2000	720	1,733	321	2,774	741	0
2001	4,322	1,066	48	5,092	2,063	0
2002	4,929	174	1,121	6,224	2,713	0

The coho salmon return to BAFF in the fall of 2001 was 175 (Table 3). This represents an all time low and is well below the eleven year average of 2,033. Approximately 0.1 million coho salmon eggs were collected at BAFF in the fall of 2001. Low flow in the Kewaunee River no doubt affected the coho return, but is not likely the only factor responsible for the near failure of coho at BAFF in 2001.

Table 3. Yearly summary of coho salmon returns and egg collection at the Besadny Anadromous Fisheries Facility, 1990 through 2001.

Year	Number of fish harvested	Number of fish passed upstream	Dead fish	Hatchery transfer	Total number of fish examined	Adipose clipped	Number of eggs harvested
1990	1,889	1,813		185	3,887		1,374,000
1991	780	287		73	1,140		790,000
1992	307	596			958		163,000
1993	448	130	326	725	1,671		529,000
1994	433	185	97		746		350,000
1995	698	2,744	325		3,767		535,000
1996	632	989	248		3,328[1]	54	688,000
1997	773	337	52		1,162	251	524,000
1998	847	1,518	67		2,432	299	607,898
1999	809	536	143	150	1,638		1,445,423
2000	768	656	205		1,629		1,115,000
2001	124	34	17		175		109,000
2002	184	37	20		241		160,000

[1] Coho salmon total includes 1,459 fish sacrificed for disease control

The steelhead return to BAFF in 2002 was 379 (Table 4), with the majority returning in the spring as Chambers Creek and Ganaraska strains. This was the second lowest spring steelhead return and the lowest fall return since BAFF was established for steelhead egg collection. Low flow could be partially responsible for the low return, but other factors are likely contributing to the reduced return. During the previous ten years an average of 1,935 steelhead have been processed each year at BAFF.

Table 4. Yearly summary of steelhead returns and egg collection at the Besadny Anadromous Fisheries Facility, 1990 through 2002.

Year	Number of fish harvested	Number of fish passed upstream	Dead fish	Hatchery transfer	Total number of fish examined	Adipose clipped	Number of eggs harvested
1992 – Spring		2,892	446		3,338		
1992 – Fall		66		408	474		
1993 – Spring		2,096	177		2,273		
1993 – Fall		30		175	205		
1994 – Spring		2,804	164		2,968		
1994 – Fall		321		200	521		
1995 – Spring		1,696	151		1,847		756,000
1995 – Fall		457	9	121	587		
1996 – Spring		1,964	180		2,144		454,000
1996 – Fall		24	18	151	193		
1997 – Spring		1,955	136		2,091		780,000
1997 – Fall		85	6	40	131		50,600
1998 – Spring		746	130		876		400,000
1998 – Fall		41	2	7	50		15,000
1999 – Spring		608	124	0	732		508,000
1999 – Fall		61	7	77	145		100,000
2000 – Spring		220	120	0	340		259,000
2000 – Fall		2	0	5	7		0
2001 – Spring		324	89	0	413		269,000
2001 – Fall		6	0	7	13		Unknown
2002 – Spring		307	69	0	376		Unknown
2002 – Fall		0	0	0	0		0

A record number of 10,439 chinook salmon were captured and examined at the RRSF in the fall of 2002. The majority of the chinook (10,011 or 96 percent) were passed upstream (Table 5). No chinook salmon eggs were collected for hatchery production at RRSF in the fall of 2002 as all chinook eggs were collected at SCW during the fall of 2002. Eggs were collected at RRSF in 2000, 2001 and 2002 from a sample of fish for a cooperative chinook salmon experiment project.

A total of 2,548 coho salmon were also examined at the RRSF in the fall of 2002 (Table 5). The majority of coho salmon (2,076 or 81 percent) were passed upstream, and 192 coho were transferred to a WDNR hatchery for holding until the fish ripened and gametes could be collected. Approximately, 0.85 million coho eggs were collected.

Table 5. Yearly summary of chinook and coho salmon returns and egg collection at the Root River Steelhead Facility, 1994 through 2002.

Year	Number of fish harvested	Number of fish passed upstream	Dead fish	Hatchery transfer	Total number of fish	Adipose clipped	Number of eggs harvested
Chinook Salmon							
1994	129	1,726	3		1,858	3	
1995	300	2,663	16		2,979	1	1,020,000
1996	62	5,440	87		5,589		644,000
1997	76	3,974	52		4,102		0
1998	127	3,845	5		3,977	2	93,000
1999	338	5,381	303		6,022		800,000
2000	267	6,972	143		7,382		No data
2001	288	9,697	229		10,214		No data
2002	120	10,011	308		10,439		No data
Coho Salmon							
1994	285	513	15		813		
1995	199	2,115	1,040		3,321	3	330,000
1996	161	3,940	305		4,406		2,200,000
1997	65	6,909	16	655	7,645		1,750,000
1998	90	3,336	246	328	4,000	1	760,000
1999	60	978	5	107	1,150		150,000
2000	75	2,921	181	231	3,408		1,200,000
2001	71	942	23	291	1,327		800,000
2002	217	2,076	63	192	2,548	140	850,000

Steelhead return at RRSF in 2002 was 1,604 (Table 6). Most of these steelhead (1,303 or 81 percent) returned in the spring and were likely either Chambers Creek or Ganaraska strain. The steelhead returning in fall (301 or 19 percent) were primarily Skamania strain. Approximately 1.4 million steelhead eggs were collected at RRSF in spring 2002 and at this time the egg take from fall steelhead has not been completed.

Table 6. Yearly summary of steelhead returns and egg collection at the Root River Steelhead Facility, 1994 through 2002.

Year	Number of fish harvested	Number of fish passed upstream	Dead fish	Hatchery transfer	Total number of fish examined	Adipose clipped	Number of eggs harvested
1994 – Fall		583	47	218	848	2	200,000
1995 – Spring	120	2,582	18		2,720	2	1,008,000
1995 – Fall		208		330	538	1	300,000
1996 – Spring	150	2,970	49		3,169		775,000
1996 – Fall		105		248	353		240,000
1997 – Spring	2	2,918	125		3,045		777,000
1997 – Fall		228	2	408	638		500,000
1998 – Spring		382			382		320,000
1998 – Fall		64	1	86	151		184,000
1999 – Spring		2,131			2,263		
1999 – Fall		19	1	50	70		
2000 – Spring	64	2,107	0	0	2,171		1,552,476
2000 – Fall	0	59	0	160	219		145,922
2001 – Spring	69	790			859		788,000
2001 – Fall		176		314	490		No data
2002 – Spring	123	1,180		0	1,303	2	1,425000
2002 – Fall		48	3	250	301		No data

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STATUS OF THE COMMERCIAL CHUB FISHERY

The total reported chub harvest from commercial gill nets was 1,334,302 pounds for calendar year 2002, an increase of 24% from 2001 (Tables 1 and 2). Commercial smelt trawlers harvested an additional 147,465 pounds incidental to the targeted smelt harvest. Of this take, 26,252 pounds were sorted as marketable catch and 121,213 pounds were unsorted.

Table 1. Annual data from the chub gillnet fishery in the Southern Chub Fishing Zone.

Year[1]	Harvest	Quota	Fishers	Effort (1000 ft)	CPE
1979	992,143	900,000		12,677	78.3
1980	1,014,259	900,000		21,812	46.5
1981	1,268,888	1,100,000		18,096	70.1
1982	1,538,657	1,300,000		16,033	96.0
1983	1,730,281	1,850,000		19,490	88.8
1984	1,697,787	2,400,000		30,869	55.0
1985	1,625,018	2,550,000		32,791	49.6
1986	1,610,834	2,700,000		34,606	46.5
1987	1,411,742	3,000,000	59	32,374	43.6
1988	1,381,693	3,000,000	60	58,439	23.6
1989	1,368,945	3,000,000	64	48,218	27.6
1990	1,709,109	3,000,000	54	41,397	41.3
1991	1,946,793	3,000,000	58	45,288	43.0
1992	1,636,113	3,000,000	53	40,484	40.4
1993	1,520,923	3,000,000	58	42,670	35.6
1994	1,698,757	3,000,000	65	35,086	48.4
1995	1,810,953	3,000,000	59	28,845	62.8
1996	1,642,722	3,000,000	56	27,617	59.5
1997	2,094,397	3,000,000	53	28,442	73.6
1998	1,665,286	3,000,000	49	23,921	69.6
1999	1,192,590	3,000,000	46	25,253	47.2
2000	878,066	3,000,000	41	22,395	39.2
2001	1,041,066	3,000,000	44	26,923	38.7
2002	1,270,456	3,000,000	47	24,940	50.9

[1] Data for the Southern Chub Fishing Zone are shown by fishing license year. For example, the 1979 license year ran from July 1 of 1978 through June 30 of 1979.

Table 2. Annual data from the chub gillnet fishery in the Southern Chub Fishing Zone.					
Year[2]	Harvest	Quota	Fishers	Effort (1000 ft)	CPE
1981	242,277	200,000		4,920	49.0
1982	251,832	200,000		3,470	72.5
1983	342,627	300,000		6,925	49.5
1984	192,149	350,000		6,148	31.2
1985	183,587	350,000		3,210	57.2
1986	360,118	400,000		7,037	51.2
1987	400,663	400,000	23	6,969	57.5
1988	412,493	400,000	23	8,382	49.2
1989	322,058	400,000	25	8,281	39.7
1990	440,818	400,000	23	8,226	53.6
1991	526,312	400,000	22	9,454	55.7
1992	594,544	500,000	24	11,453	51.9
1993	533,709	500,000	24	15,974	33.4
1994	342,137	500,000	24	8,176	41.8
1995	350,435	600,000	24	5,326	65.8
1996	332,757	600,000	24	4,590	72.5
1997	315,375	600,000	23	4,366	72.2
1998	266,119	600,000	23	3,029	87.9
1999	134,139	600,000	23	1,670	80.3
2000	77,811	600,000	21	2,200	35.4
2001	36,637	600,000	21	972	37.7
2002	63,846	600,000	21	1,099	58.1

By zone, the harvest in the south was 1,270,456 pounds, a 22% increase compared to the 2001 harvest, while in the north 63,846 pounds were reported caught, an increase of 74% compared to 2001. About half of the entire catch and effort occurred in January of 2002 in the northern zone. The harvest in the south represented about 42% of that zones quota while the harvest in the north amounted to about 11% of that zone's quota. CPEs were very similar between zones with an increase in both compared to 2001. The south showed a 24% increase while the north had a 35% increase from 2001. Effort declined in the southern zone by about 2 million feet and increased slightly in the north. In the south, 33 of the 47 permit holders reported harvesting chubs while in the north 8 of 21 reported harvesting chubs.

Chub assessment in 2002 marked the first year that otoliths, a small piece of calcified material commonly referred to as ear stones, were extracted and used to age harvested chubs. This replaced the common scale method that has been used the past 25 years for aging purposes. The otolith method has been found to be more accurate, especially when dealing with older populations of fish.

Population assessments with graded-mesh gill nets were conducted in the fall of 2002 off Algoma, Baileys Harbor and Sheboygan. Samples of chubs were also collected out of standard mesh gear fished off these ports. The use of otoliths for aging chubs indicated that scale reading might have under-aged fish in the last several years. Fish up to 21 years of age were collected off Baileys Harbor and Sheboygan (Figure 1). The population was dominated by fish older than 10 years of age with ages 11 through 16 being the most common. We continue to see very few young fish in

[2] Data for the Northern Chub Fishing Zone are shown by calendar year.

our assessment gear. The youngest chubs (age 6 and 7) were caught off Sheboygan, in very low numbers, while age 8 were the youngest caught off Baileys Harbor and Algoma. Catches overall were best off Sheboygan, followed by Baileys Harbor and Algoma.

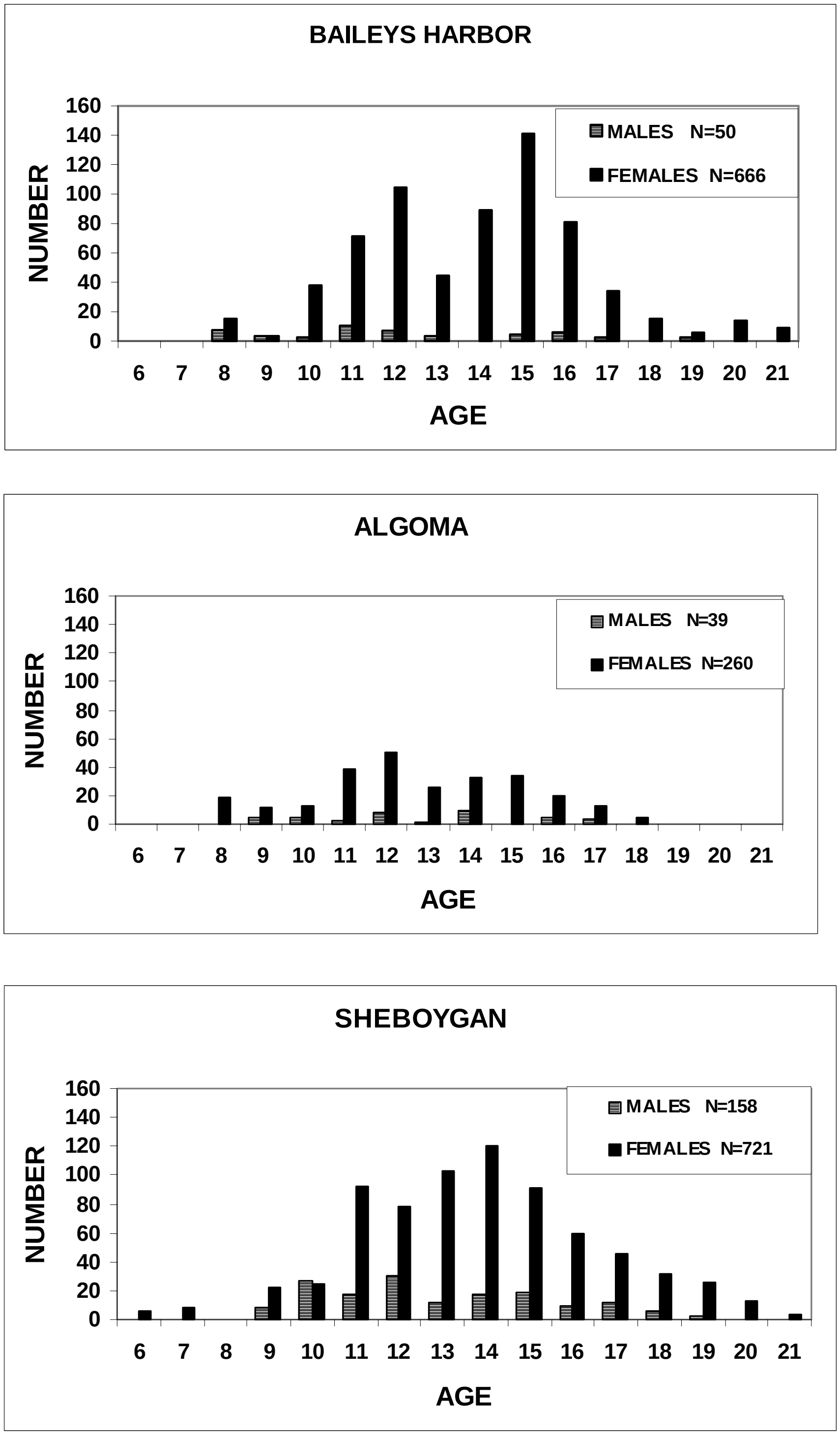

Figure 1. Age composition by number and sex of chubs captured during graded mesh assessments at three locations along the Wisconsin shoreline, fall 2002.

Chubs continue to show very little growth as they age (Figure 2). Very few fish age 6 were caught, thus the large average size from our assessments for this age is skewed. As in the graded mesh, very few young fish were caught from standard mesh in the commercial gear (Figure 3). Ages 12 through 15 were the most common but chubs as old as 23 years of age were caught.

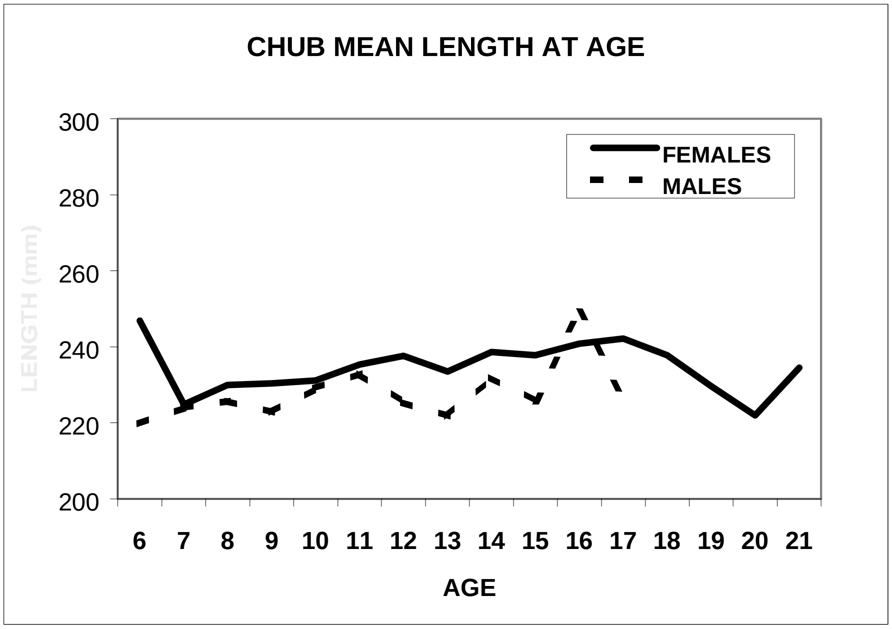

Figure 2. Average length by age and sex of chubs captured during graded mesh assessments off Algoma, Baileys Harbor and Sheboygan (chub data pooled from three locations).

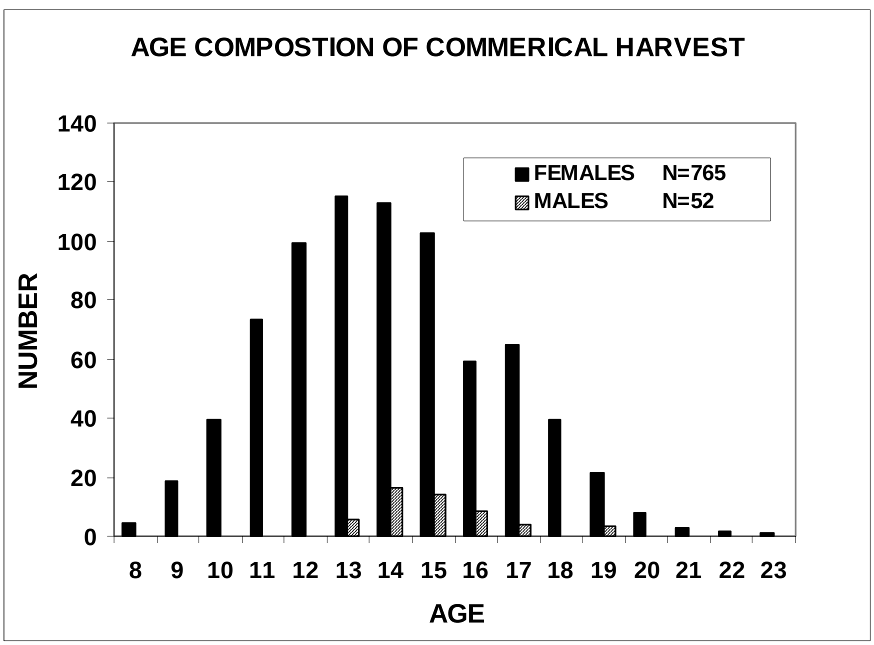

Figure 3. Age composition of chubs by number and sex sampled from commercial nets (2-1/2 and 2-3/8 “) off Algoma, Baileys Harbor and Sheboygan (data pooled).

Sex ratios of chubs from standard mesh and graded mesh continue to show a predominance of females. Ratios of female to male were almost identical to catches in 2001. In the graded mesh 87% of the catch was female while in the standard mesh 94% were female. The one advantage of the female-dominated population to the industry is that commercial fishers have profited through the sale of abundant eggs to the caviar market during late fall and winter months.

The following people were instrumental in varying aspects of this project: Dan Makauskas, of the Illinois DNR, for his guidance and training of our staff in the aging technique of otoliths. Pat McKee and Cheryl Peterson for data collection, entry, and summary and David Schindelholz and Pradeep Hirethota for assistance with aging otoliths.

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STATUS OF THE LAKE WHITEFISH FISHERY

The reported commercial harvest of lake whitefish *Coregonus clupeaformis* from the Wisconsin waters of Lake Michigan (Figure 1) during quota year 2001-02 dropped to 1,469,626 pounds with 3.4 percent of the total harvest from pound nets, 70.6 percent in trap nets, and 26.0 percent in gill nets. The total annual quota of whitefish for Wisconsin commercial fisherman has been increased four times since it was first established at 1.15 million pounds in quota year 1989-90 and is currently at 2.47 million pounds.

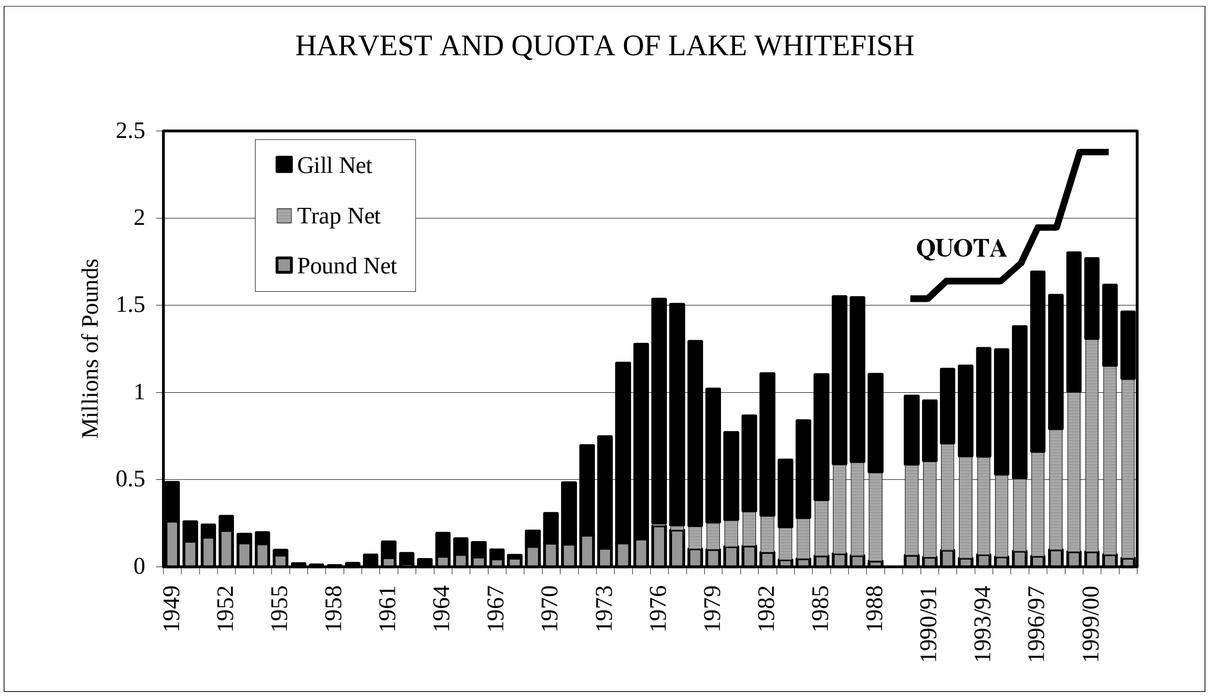

Figure 1.-Lake Whitefish reported commercial harvest by gear in pounds (dressed weight) from Wisconsin waters of Lake Michigan including Green Bay, from 1949 through 2002. (Calendar years 1949 through 1988; quota years 1989-90 through 2001-02).

Wisconsin commercial fishermen have used trap nets as a legal gear to harvest lake whitefish from Lake Michigan since 1976. The use of trap nets has increased steadily and over the last 13 years has accounted for over 50 percent of the whitefish harvest. Over the last three years trap nets have accounted for 69 percent of the lake whitefish harvest which is a direct result of more trap net effort and less gill net effort (Figure 2). Trap net effort is up to over 2,800 pot lifts per year, and gill net effort is down to less than 7 million feet per year. Catch per effort (CPE) has shown a general downward trend over the last three to five years in all types of commercial gear (Figure 3), but, changes in seasonal whitefish distribution may have contributed to this decline.

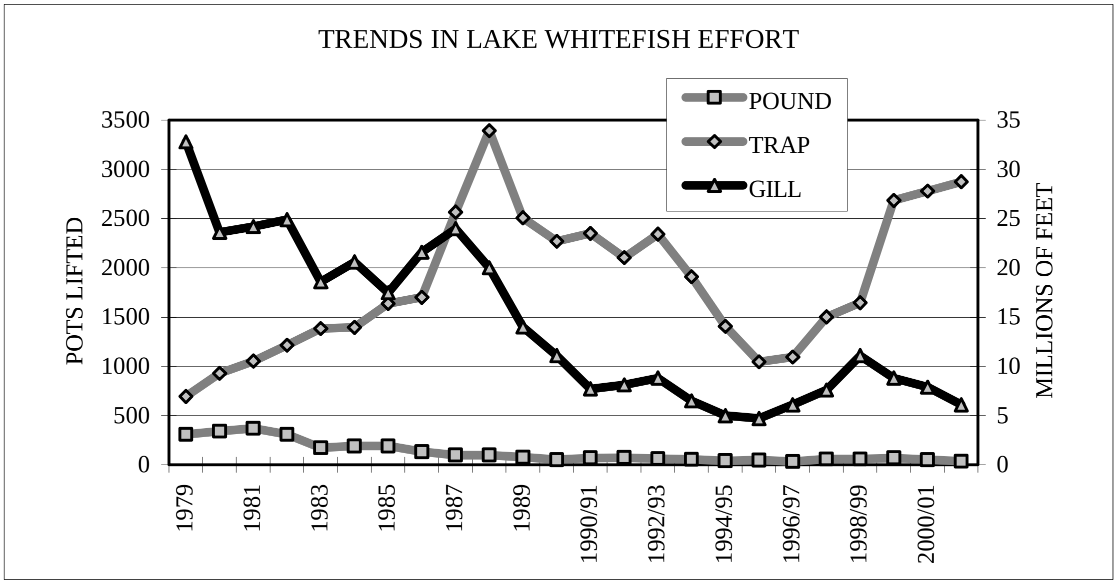

Figure 2.-Trends in gill net, trap net, and pound net effort fished for lake whitefish in Wisconsin waters of Lake Michigan, including Green Bay, 1979 through 2002. (Gill net effort = millions of feet; trap net and pound net effort = number of pots lifted).

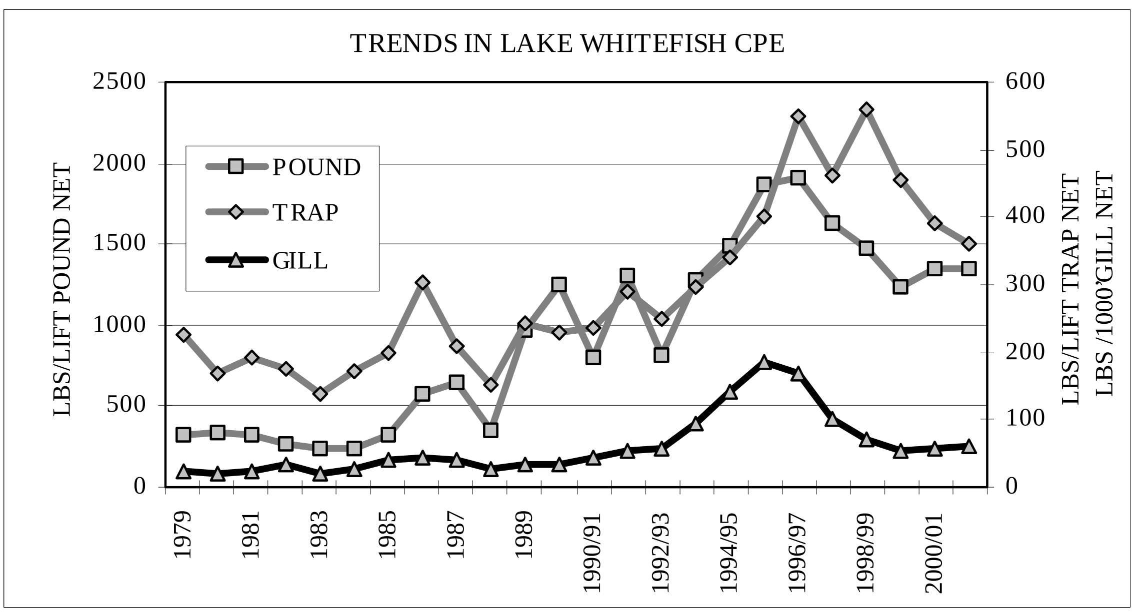

Figure 3.-Trends in gill net, trap net, and pound net lake whitefish commercial catch per effort (CPE) in the Wisconsin waters of Lake Michigan including Green Bay, 1979 through 2002. (Gill net CPE = pounds of whitefish harvested per 1,000 feet lifted; trap net and pound net CPE = pounds of whitefish harvested per pot lifted).

Initially, trap nets used by commercial fishermen in the Wisconsin waters of Lake Michigan and Green Bay, were restricted to waters less than 13 fathoms (78 feet). Meanwhile, Wisconsin commercial fishermen in Lake Superior, and Michigan commercial fishermen were allowed to fish trap nets to depths of 15 fathoms (90 feet). In the Wisconsin Lake Michigan commercial fishery, whitefish catch per effort (CPE) in trap nets increased steadily through 1996, but then during 1997 and 1998, trap net fishers started to experience seasonal difficulty catching whitefish at depths where whitefish had been traditionally caught (Figure 4). Whitefish CPEs during the months of May, June, July, and August, dropped 36%, 60%, 69%, and 39% respectively from 1996 to 1998. There was a perception among the commercial industry that the reason for decreased trap net CPEs was the movement of whitefish to deeper waters. Concurrent with these changes was the rapid expansion of the zebra mussel population and noted increase in water clarity, increase in double crested cormorant numbers, and decline in diporeia numbers. When the trap net depth restriction was increased to 90 feet in 1999, trap net CPEs rebounded to near 1996 levels, but then fell again over the next several years.

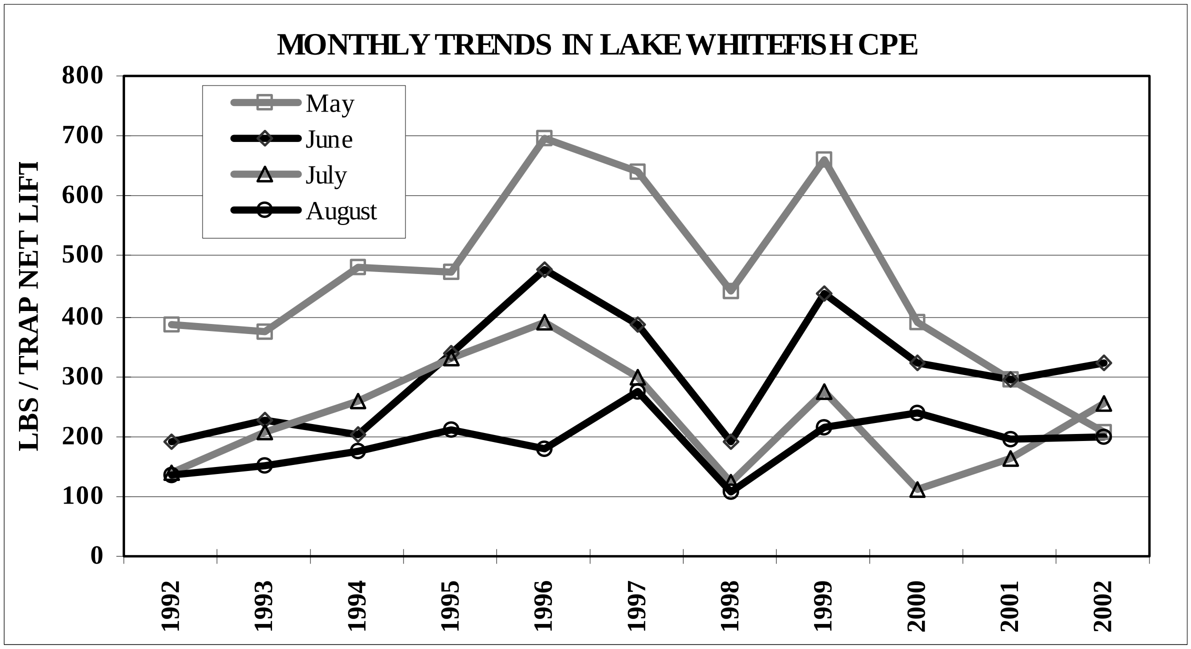

Figure 4.-Monthly trends in Wisconsin commercial trap net CPEs 1991 through 2002. In the Wisconsin waters of Lake Michigan and Green Bay, trap nets were restricted to water less than 78 feet 1991 through 1998, and water less than 90 feet 1999 through 2001. In 2002 the depth to which trap nets could be fished was increased to 150 feet.

In response to requests for deeper trap net sets the Wisconsin Department of Natural Resources (WDNR), in cooperation with Wisconsin commercial fishers, conducted a study to evaluate the impacts of fishing trap nets to depths of 150 feet. Based on the results of this study, the WDNR has implemented a rule change that permits the use of trap nets to depths of 150 feet in 2002. In 2002, trap net CPE continued downward in May while CPEs in June and July rebounded slightly, and August CPE remained relatively unchanged.

Analysis of the whitefish data collected in 2002 has not been completed. However, in spring 2001 whitefish mean length and weight at age (ages 2-5) were near the lowest values documented since 1985. As a result of the decreased length and weight at age, the age at which whitefish are fully recruited to the commercial fishery has increased from age four to age five.

Concurrent with the decline of mean length and weight at age, there has been a marked decline in the condition of whitefish in the North/Moonlight Bay (NMB) population (Figure 5). Condition as used in this context is a measure of the relative plumpness of the fish. From 1995 through 1999, ages two through six exhibited a distinct downward trend in condition. In the spring of 2000 and 2001, ages two and three demonstrated a reversal of this trend and ages four through six leveled off.

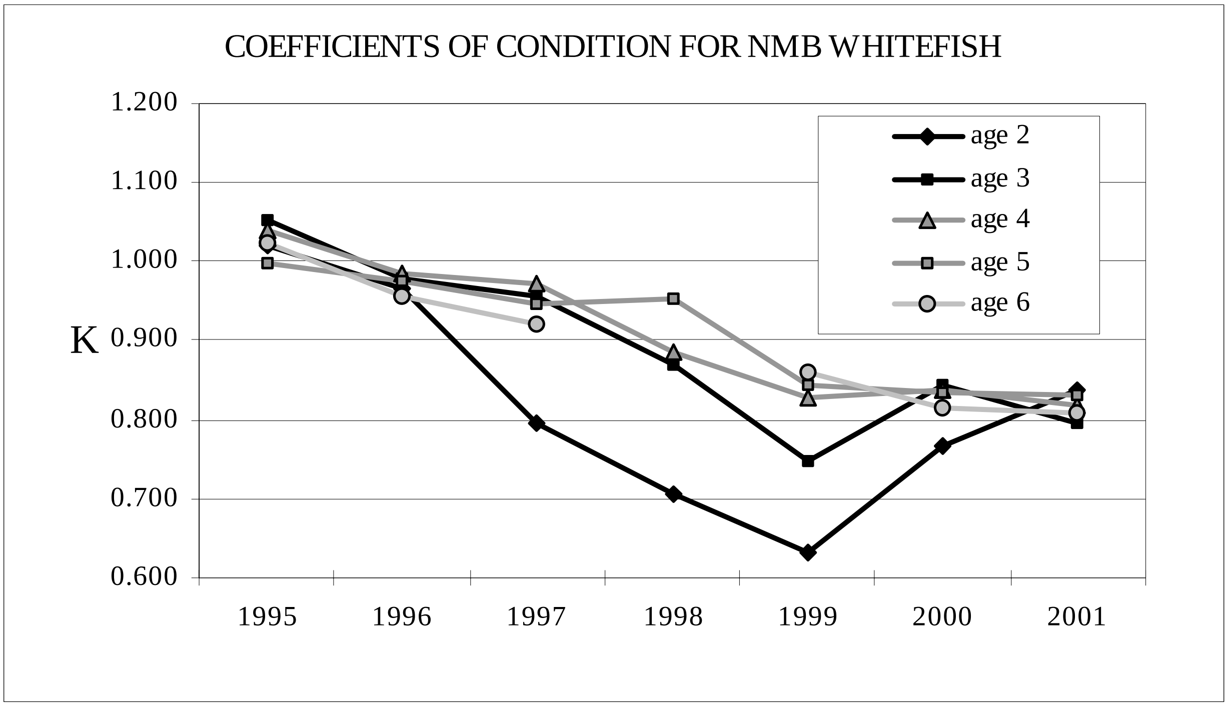

Figure 5.-Condition of lake whitefish from the NMB stock 1995 through 2001. Condition (K) as used in this context is a measure of the relative plumpness of the fish. To avoid possible variations caused by gonad development or condition, only whitefish sampled in spring were utilized for this analysis.

The spring graded mesh gill net (GMGN) juvenile whitefish survey conducted by WDNR over the years 1999 to 2001 was a near bust. The Juvenile survey conducted in spring 2002 has not been analyzed. This survey typically provides the first indication of whitefish year class strength, two or more years before they show up in the commercial fishery. Recently, the 1991, 1993, 1994, 1995, and 1997 cohorts of the NMB seem to be particularly strong, and the 1992 and 1996 cohorts seem to be weaker than most. Not enough information is available to evaluate the 1998 or 1999 year classes.

Based on the fall GMGN survey conducted by WDNR there has been a continued progression of moderate to strong year classes of the NMB stock of whitefish recruiting to the commercial fishery. In addition to no missing year classes in the NMB whitefish population currently vulnerable to the fall GMGN survey, there continues to be good survival to age seven and older. Observations from the fall GMGN survey support those from the spring juvenile survey in that the 1992 year class that showed up as weaker than most in the juvenile surveys is also weaker than most in the fall surveys. The 1996 year class first captured at age three in the fall of 1999 (although not fully vulnerable to the gear) was captured at a lower rate than all other cohorts.

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SMELT WITHDRAWAL BY THE COMMERCIAL TRAWL FISHERY

Historically, commercial trawling targeted three main species of fish in the Wisconsin waters of Lake Michigan. Much of the harvest was a general forage catch that caught large numbers of fish, chiefly alewife *Alosa pseudoharengus*, rainbow smelt *Osmerus mordax*, and bloater chub *Coregonus hoyi*. The other portion of the trawl fishery was a targeted rainbow smelt harvest. With the adoption of new rules in 1991 the general forage harvest component of the fishery was eliminated. Targeted rainbow smelt trawling rules were established for the waters of Lake Michigan and Green Bay and the harvest quota set at 2.358 million pounds, of which no more than 830,000 pounds could be caught in Green Bay. During 1999, a new quota was established that reduced total harvest to 1,000,000 pounds, of which no more than 351,993 pounds could be harvested from Green Bay.

By utilizing the required biweekly catch reporting forms, it can be determined that commercial smelt trawlers reported catching 294,541 pounds of rainbow smelt during 2002 (Figure 1). This reported catch was 19.8 % higher than the reported 2001 harvest of 246,170 pounds. Despite the increased catch in 2002, the 2002 rainbow smelt harvest was only 54% of the average catch of the previous five years (1997-2001).

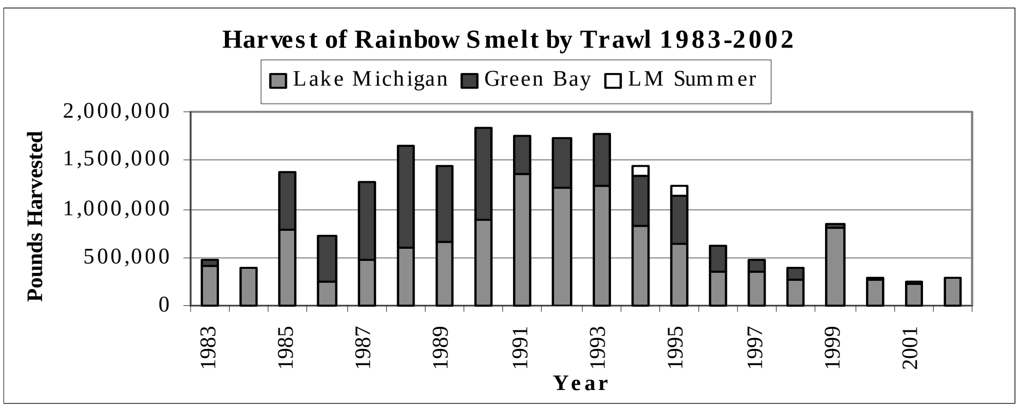

Figure 1. Reported rainbow smelt harvest by trawl from the Wisconsin waters of Lake Michigan for the years 1983 through 2002.

The harvest of rainbow smelt from Lake Michigan was 294,541 pounds (Figure 1), with an average CPE of 173 pounds per hour trawled (Figure 2). The 2002 Lake Michigan rainbow smelt harvest was the highest reported since 1999 when 794,151 pounds was harvested, but still fell short the five year average of 382,445 pounds. CPE on Lake Michigan increased to 173 pounds per hour trawled, the highest since 1999.

Commercial trawlers on Green Bay reported a rainbow smelt catch of 291 pounds (Figure 1), with a CPE of 14 pounds per hour trawled (Figure 3). The 2002 rainbow smelt harvest on Green Bay was the lowest ever reported and far below the five year average of 70,550 pounds.

The commercial rainbow smelt harvest has declined dramatically since peaking in the early 1990’s and for the past three years has remained at a stable, substantially lower level than seen during the past decade. Except for 1999, when trawlers reported an increase in rainbow smelt harvest numbers not forecasted by the U.S.G.S. in 1998, the harvest of rainbow smelt by commercial trawlers has been similar to population trends determined by the U.S.G.S from their fall index trawling. Sharp declines in rainbow smelt harvest and CPE in 2000 and 2001 by trawlers seem to indicate that 1999 was an unusual harvest year and that lakewide rainbow smelt numbers remained depressed from past levels. Recent U.S.G.S trawl data does not indicate any major change in lakewide rainbow smelt abundance, so it is likely that commercial harvest will not substantially change in the near future.

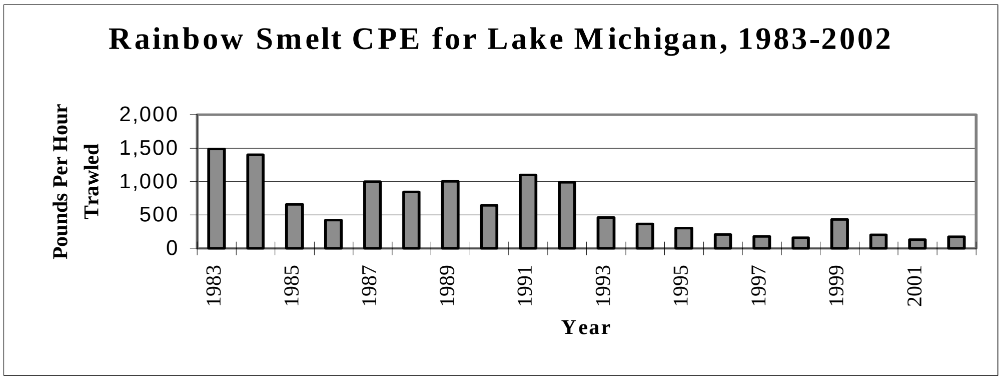

Figure 2. Rainbow smelt CPE in pounds per hour trawled on Lake Michigan during the years 1983 through 2002.

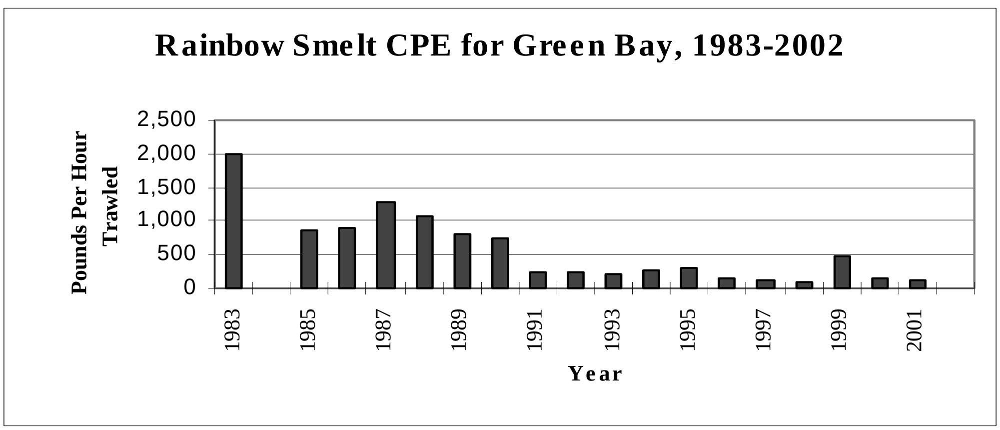

Figure 3. Rainbow smelt CPE in pounds per hour trawled on Green Bay during the years 1983 through 2002.

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STATUS OF WALLEYE STOCKS - FOX RIVER

Abundance

The adult spawning population of walleye in the Fox River for the spring of 2002 (age 3 and older; and greater than 370 mm, Figure 1) was estimated at 8,058 (95% CI 5,935-11,230). While population levels had remained stable for the past three years but substantially lower than the preceding ten year average of 27,700 adult walleye, the 2002 estimate is the lowest in sixteen years. Continued low water levels on Green Bay have compromised our ability set nets in appropriate locations. This may be effectively limiting adequate sampling of the entire population occupying the river. In addition, extreme fluctuations in air and corresponding water temperatures occurred in the spring of 2002. These extremes may have disrupted normal spawning behavior. We still believe that harvest is not contributing to the low abundance. Assuming a majority of the walleye from lower Green Bay and the Fox River are spawning in the river, harvest in 2001 was less than three percent of the estimated 16,000 adult walleye in the spring of 2001. Harvest alone could not account for a fifty percent decline the spawning population the following year, 2002. A poor 1999 year class may also be contributing to the low abundance (Figure 3.).

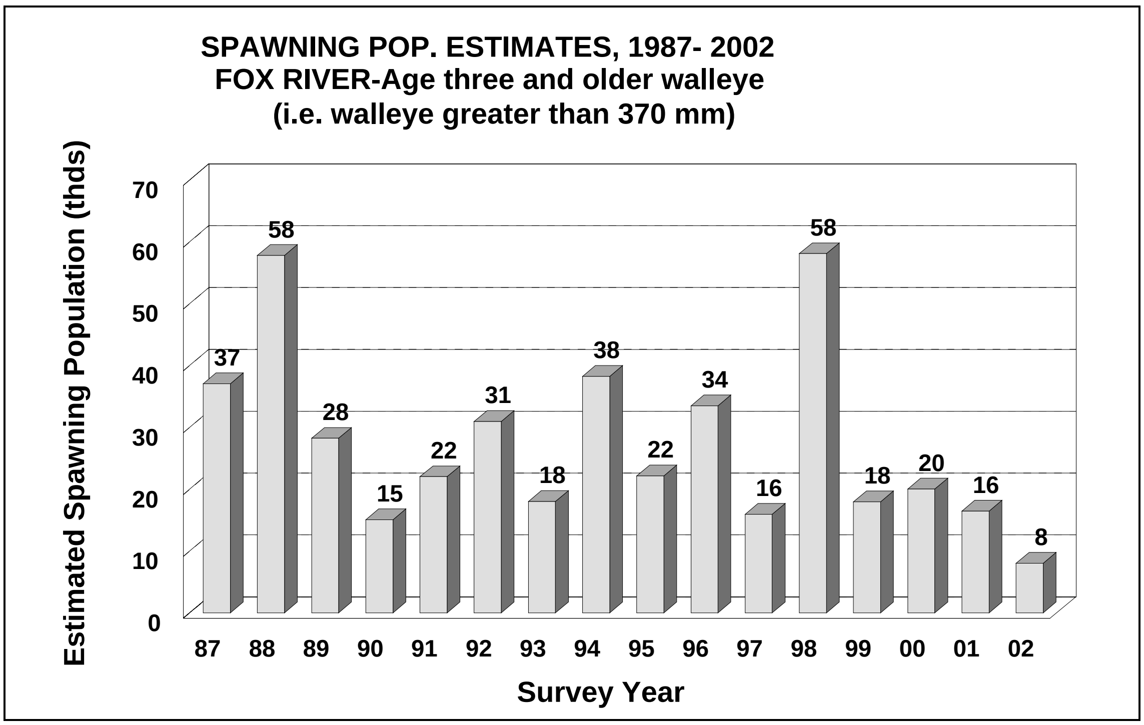


Figure 1. Spawning population estimates of Fox River adult walleye greater than 370 mm in length (ages three and older) from surveys conducted between 1987 and 2002.

We estimated only 127 three year old male walleye were recruited to the spawning population in survey year 2002 (Figure 2.). The 1999 year class of male walleye was the poorest in sixteen years of spawning assessments. This was somewhat predictable, however, because the year class, as measured as recruited fall YOY in 1999, was shown to be the third worst since we began conducting fall surveys (Figure 3.). Two consecutive years of below average three year old male abundance goes further in explaining the low spawning population. In the case of the 1999 year class it was expected, but the preceding year (1998 year class) was expected to contribute substantially to the spawning population in 2001, but failed.

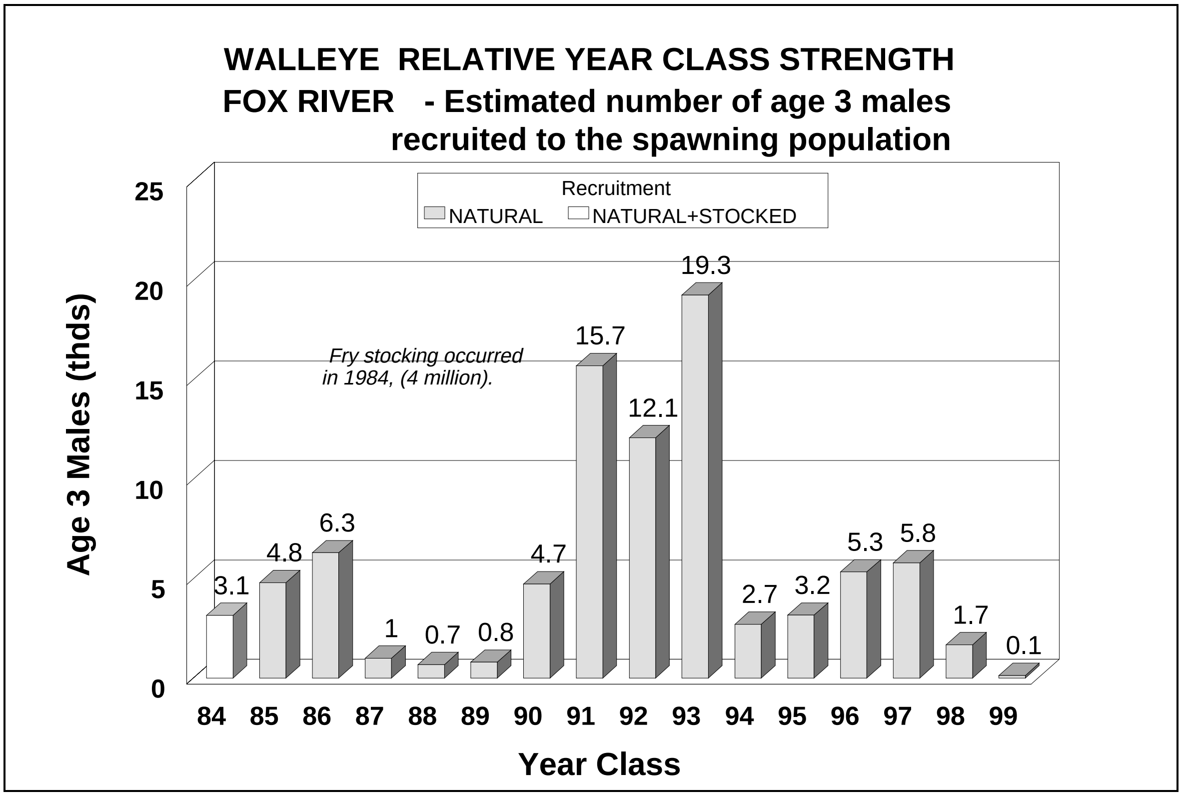


Figure 2. Relative year class strength of Fox River walleye as measured by the estimated number of age three walleye recruited to the adult spawning population from surveys conducted in 1987-2002.

Age Structure

The age structure of males and females in the spawning population for 1998-2002 are shown in Tables 1 and 2. Age four cohorts (1998 year class) were most abundant in the spawning population in 2002, representing 29.3% of all males. Based on age two abundance, we had expected the 1998 year class to show much better strength than it has the last two years. Three year old males represented only 7.7 % of the male population in 2002. This year class (1999) appeared weak as age two walleye in the 2001 survey, as well as in YOY index surveys (Figure 3.).

Based on the 2001 survey data we expected the age four females to be well represented, but the represented only 17.7 of adult females. Because maturation of females is not complete until age five, it may be premature to evaluate their abundance.

Table 1. Age Distribution (%) of Male Spawning Walleye – Fox River 1998-2001											
Age	2	3	4	5	6	7	8	9	10	11	12	∃13
1998	2.0	16.8	35.5	37.2	6.2	1.6	0.4	0.0	0.1	0.1		
1999	3.3	53.2	10.4	20.5	9.5	2.0	1.0					
2000	11.5	48.7	26.3	9.7	3.1	0.5	0.2					
2001	0.4	20.5	41.6	20.3	12.0	3.4	0.6	0.4	0.6	0.2		
2002	1.6	7.7	29.3	22.0	20.7	8.9	5.3	1.6	1.2	1.2		.04

Table 2. Age Distribution (%) of Female Spawning Walleye – Fox River 1998-2001												
Age	2	3	4	5	6	7	8	9	10	11	12	∃13
1998		1.0	14.1	25.3	30.6	15.3	5.2	2.6	3.4	1.0	0.5	0.9
1999			4.0	32.9	22.1	19.1	8.9	4.6	2.7	3.8	1.3	0.5
2000		1.8	26.1	27.9	27.3	10.9	2.6	0.9	1.7	0.6		
2001		6.0	10.8	33.6	16.3	9.8	10.0	6.0	2.7	2.7	1.6	0.5
2002		0.2	17.7	17.3	21.0	10.0	12.3	12.5	4.4	2.7	0.6	1.2

Recruitment of YOY

In both 2002 and again in 2001 , results of the fall electrofishing surveys have shown YOY survival to the fall fingerling stage to be average and above (Figure 3). The 2001 year class appears to be in the same range of magnitude as the 1998 year class, however, we hope that it will recruit to age three much better than did the 1998 year class. Based on these survey data, 2001 cohorts are the fourth most abundant, exceeded only by the 1998, 1993 and 1991 year classes. The 2002 recruits fall solidly in the mid-range of recruitment as measured by this index. On this basis we remain cautiously optimistic that the adult population of walleye will recovery from the low abundance seen in the spring 2002 survey.

Catch and Harvest

The walleye catch for Wisconsin waters of Green Bay was estimated at 43,000 walleye during the open water season in year 2002 down from 55,700 caught in 2001, a 23% reduction (Figure 4.). This marks the second consecutive year showing a catch reduction. Both Brown (13,800) and Marinette (21,900) Counties, again, had a reduction in catch, 2% and 45% respectively. Door/Kewaunee and Oconto County showed an increase, the greatest occurring in Oconto County where catch increased over eight fold to 5,800 walleye. Door Counties catch improved modestly from 1,100 caught in 2001 to 1,500 in 2002, a 36 % increase.

Total harvest on Green Bay dropped from 24,193 walleye in 2001 to 15,000 Bay wide in 2002 (Figure 5.). Brown County's harvest doubled from 300 to 600 walleye and Oconto County's harvest increase 13 fold to 5,100. Walleye harvest in Marinette County was most severe, dropping from 22,900 walleye in 2001 to 9,000 walleye in 2002. Door/Kewaunee's harvest dropped by 67% from 600 walleye to 200 walleye.

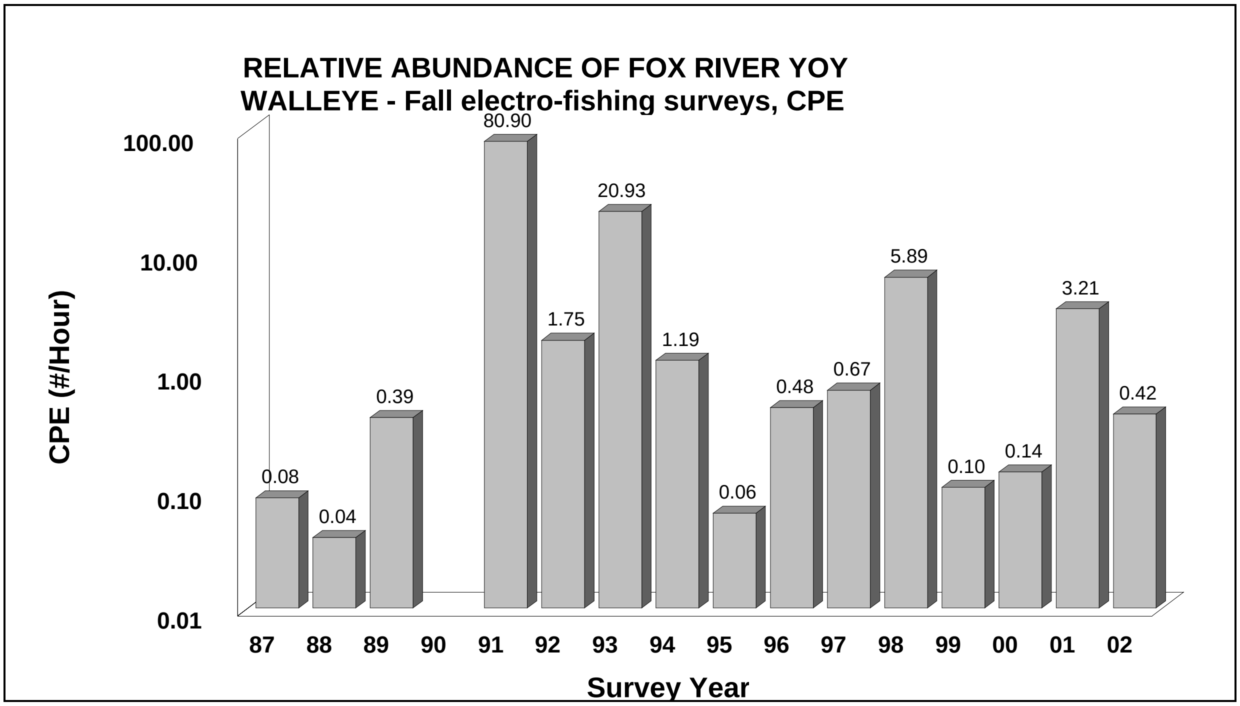
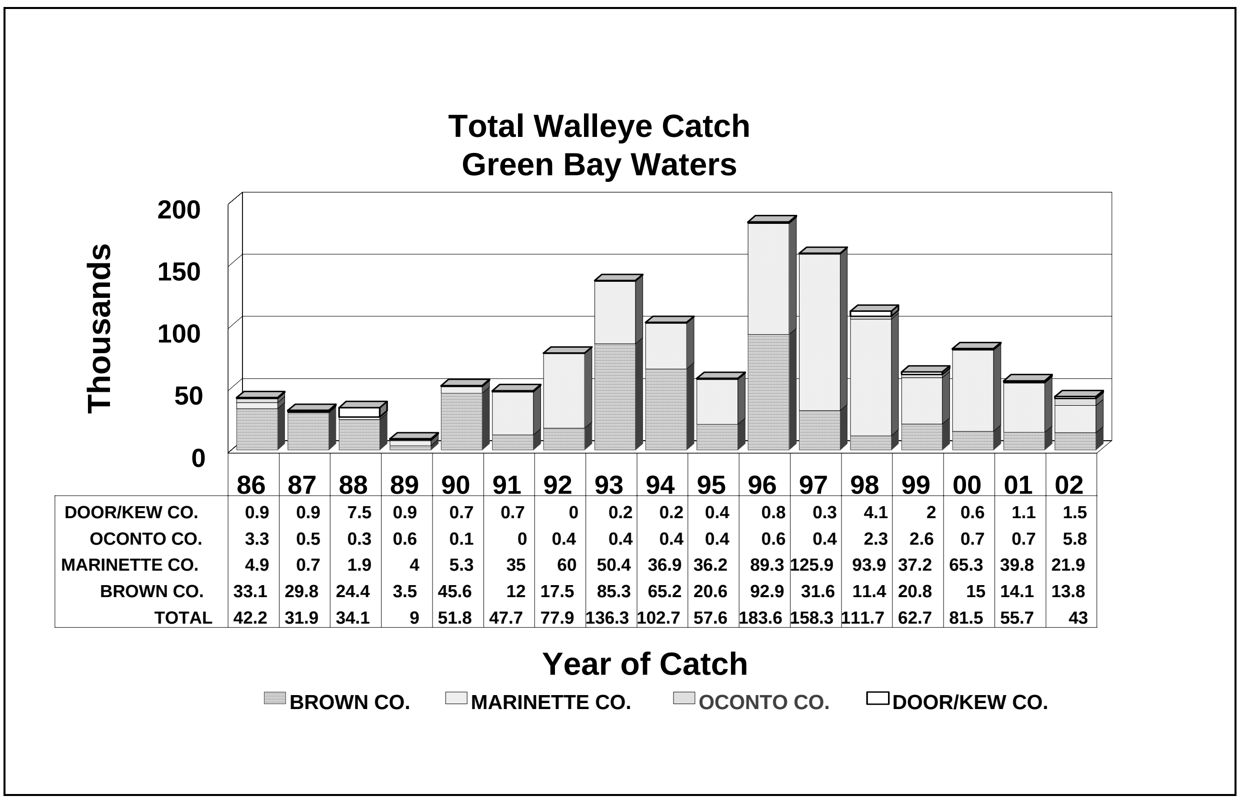
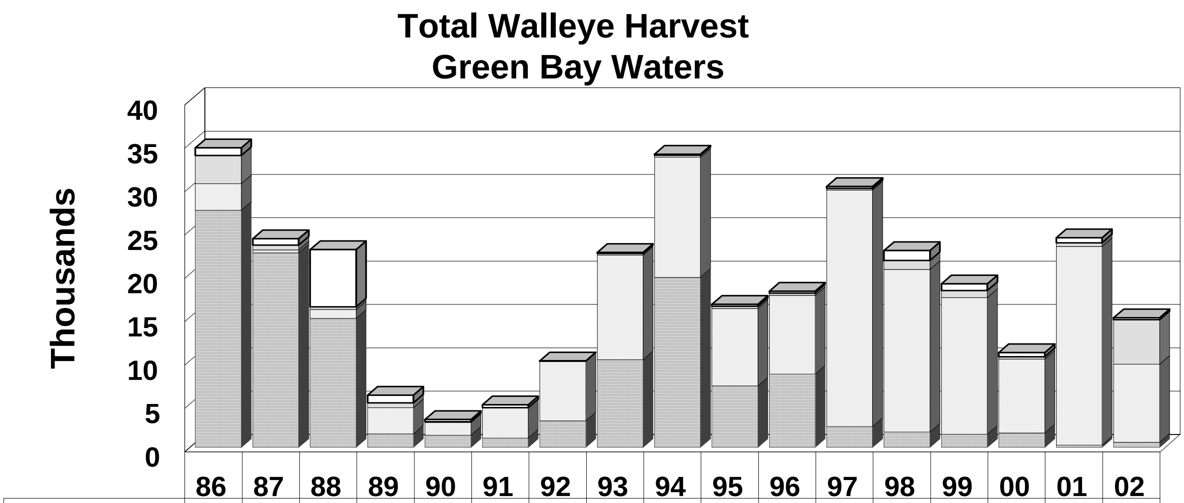


Figure 3. Relative abundance of YOY walleye in the Fox River as measured by catch per unit effort (CPE) from data collected in electrofishing surveys for years 1987-2002.



	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
DOOR/KEW CO.	0.9	0.9	7.5	0.9	0.7	0.7	0	0.2	0.2	0.4	0.8	0.3	4.1	2	0.6	1.1	1.5
OCONTO CO.	3.3	0.5	0.3	0.6	0.1	0	0.4	0.4	0.4	0.4	0.6	0.4	2.3	2.6	0.7	0.7	5.8
MARINETTE CO.	4.9	0.7	1.9	4	5.3	35	60	50.4	36.9	36.2	89.3	125.9	93.9	37.2	65.3	39.8	21.9
BROWN CO.	33.1	29.8	24.4	3.5	45.6	12	17.5	85.3	65.2	20.6	92.9	31.6	11.4	20.8	15	14.1	13.8
TOTAL	42.2	31.9	34.1	9	51.8	47.7	77.9	136.3	102.7	57.6	183.6	158.3	111.7	62.7	81.5	55.7	43

Figure 4. Total walleye catch for Wisconsin waters of Green Bay by County for the years 1986-2002.



	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
DOOR/KEW CO.	0.9	0.7	6.6	0.9	0.2	0.3	0	0.1	0.1	0.2	0.2	0.2	1.1	0.8	0.5	0.6	0.2
OCONTO CO.	3.2	0.5	0.3	0.6	0.1	0	0	0.2	0.2	0.2	0.3	0.2	1	0.8	0.3	0.4	5.1
MARINETTE CO.	3.1	0.4	1	3	1.5	3.5	6.9	12.1	13.9	8.9	9.1	27.3	18.8	15.8	8.5	22.9	9
BROWN CO.	27.4	22.4	14.9	1.6	1.4	1.1	3.1	10.1	19.6	7.1	8.5	2.4	1.8	1.5	1.7	0.3	0.6
TOTAL	34.6	24.1	22.8	6	3.3	5.1	10	22.5	33.8	16.5	18	30.1	22.9	18.9	10.9	24.2	15

Figure 5. Total walleye harvest for Wisconsin waters of Green Bay by County for the years 1986-2002.

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STATUS OF YELLOW PERCH STOCKS - GREEN BAY

Yellow perch abundance in Green Bay increased steadily through the 1980's and has declined since then. The population growth was fueled by the production of strong year classes in 1982, 1985, 1986, 1988, and 1991 (Figure 1). Since 1991 there has been only one moderately strong year class that appeared in 1998. The estimated total biomass of yearling and older yellow perch rose from under 1,000,000 pounds in 1980 to over 10 million pounds in 1988, and then declined through the 1990's to an estimated biomass in the year 2000 of less than 500,000 pounds.

The decline in the population during the 1990's can be attributed to poor recruitment of young-of-the-year fish, as assessed in the late summer of each year (Figure 1). Following over a decade of good production of young fish, we have seen only one reasonably strong year class (1998) since 1991. The hopeful 1998 year class was abundant as 1 year olds in our trawl survey in 1999 and has been seen as the strongest year class through 2002. During 2001 and 2002 the majority of both the commercial and sport harvest has been comprised of the 1998 year class, 88% and 81% respectively (Table 1.).

Population assessment

The Green Bay yellow perch population has been monitored annually for over 20 years. Annual late summer trawl surveys at designated index sampling locations are used to monitor trends in abundance and to estimate mortality rates of individual year classes. In 2002 index trawling continued at the 78 index trawling stations, at the standard sites established in 1978 and at the additional deep-water sites that were added in 1988. The 32 deeper sites were developed as a result of a trend of increasing abundance of yellow perch observed at a single deep site (off Marinette) established in 1985. Standard and deep site information has been combined based on the amount of habitat they represent and an adjustment made for standard site information prior to 1988 to account for the increasing area of occupancy, creating a weighted area average value.

In 2002 the number of yoy yellow perch caught per trawl hour (730) ranked seventh highest in the 25 years since index sites were established in 1978, just below the 25 year average of 754 (Figure 1).

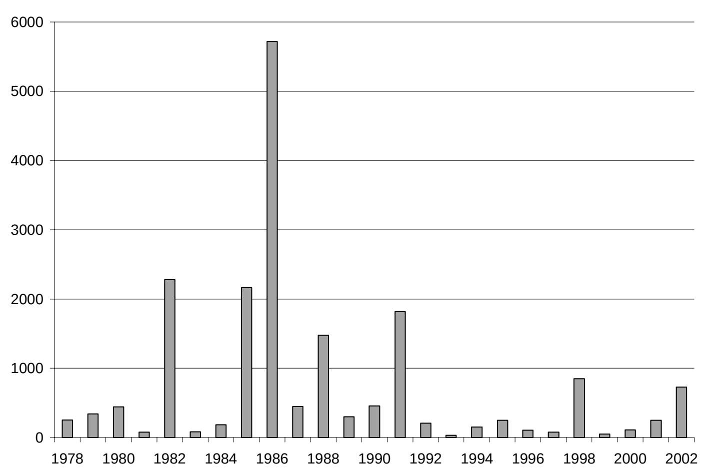

Figure 1. Relative abundance of age 0 yellow perch based on index trawls at 78 stations.

Yearling and older yellow perch abundance increased at index station sites from 2001 to 2002 (Figure. 2). The weighted area average was 92.3 in 2002 up from the record low of 85.7 in 2001. However, the catch for 2002 was still the third lowest since 1978.

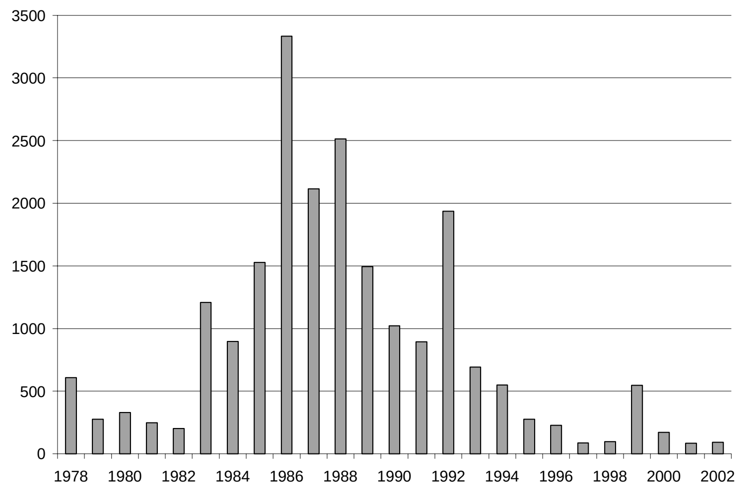

Figure 2. Relative abundance of age 1 and older yellow perch based on index trawls at 78 stations.

Harvests

The annual commercial harvest is reported by fishers, and fish sampled at the dock from commercial landings are used to describe the age and size composition of the catch.
The annual sport harvest is estimated using a creel survey, and fish obtained through the survey are used to describe the age and size composition of the catch.

Since the 1983-1984 commercial fishing license year, the yellow perch commercial harvest in Green bay has been managed under a quota system. Quota shares are allocated to individual licenses based on their harvest for four years prior to the establishment of the quota. The license year quota runs from July 1st to June 30th. The zone 1 (Green Bay) quota has ranged over the past decade from the current low of 20,000 pounds to a high of 475,000 pounds.

During the commercial fishing year 2001/2002 commercial fishers harvested almost all of their allotted limit of 20,000 pounds they harvested a total of 18,952 pounds (Figure 3). Only a gill net fishery took place during 2002.

Table 1. shows the relative age distribution of the total yellow perch harvest from 1992 through 2002. The predominance of the 1998 year class through time from age 1 in 1999 to age 4 in 2002 substantiates what has been observed in our surveys. The high proportion of the harvest coming from on year class shows that there is domination of one strong year class, this has not been seen in the past decade.

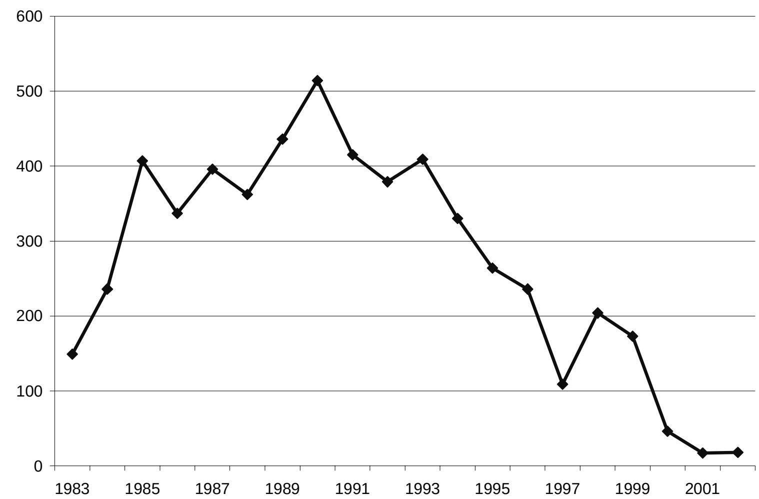

Figure 3. Commercial yellow perch harvests in thousands of pounds.

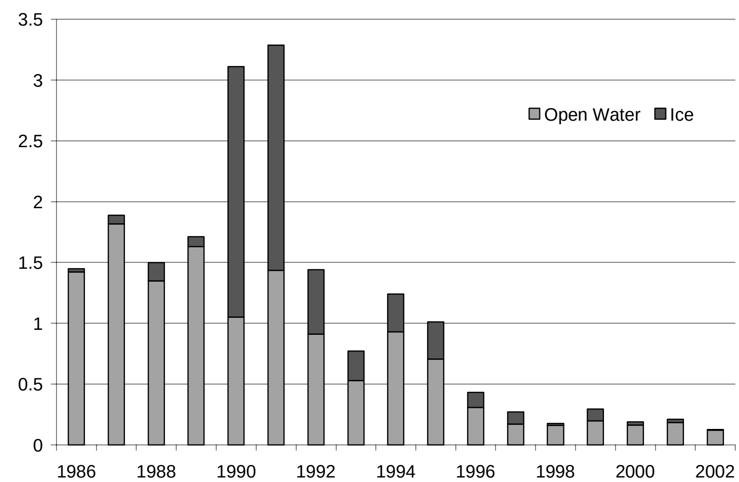

Figure 4. Estimated annual sport harvest of yellow perch from Green Bay, in millions of fish.

Sport fishing harvests have also risen and fallen with changes in yellow perch abundance. Sport harvest peaked at over 3,000,000 pounds in 1990 and 1991, when unusual ice conditions and large numbers of fish allowed the estimated harvest of 2,000,000 yellow perch through the ice each year. By the year 2001 the sport harvest had declined to an estimated 210,489 yellow perch in total, with only 24,891 being taken through the ice (Figure 4.). During 2002 catches were found to decline further to 128,010 yellow perch in total with only 6,930 being taken through the ice. The current bag limit on yellow perch is at 10, this is the lowest bag limit during the history of the green bay creel program.

Table 1. Age Distribution of the Combined Sport and Commercial Harvest (% by No.)										
Year	1+	2+	3+	4+	5+	6+	7+	8+	9+	10+
1992	.0	7.22	30.06	37.82	12.41	10.99	1.36	.10	.03	.00
1993	.04	13.23	21.55	27.19	23.66	9.17	4.16	.87	.11	.02
1994	.0	5.27	62.56	19.56	7.59	3.34	1.18	.48	.02	.00
1995	.57	5.19	10.73	72.21	8.3	1.53	1.19	.48	.02	.00
1996	.84	38.09	13.42	7.60	36.62	2.18	.88	.28	.05	.04
1997	2.87	29.44	58.64	3.41	1.16	4.11	.18	.11	.08	.00
1998	2.61	19.27	58.14	17.70	.87	.62	.70	.06	.01	.02
1999	4.97	32.78	31.78	26.73	3.15	.28	.18	.13	.01	.00
2000	1.89	46.33	29.84	10.32	10.61	.86	.16	.01	.00	.00
2001	2.43	4.37	87.48	4.59	.42	.36	.35	.00	.00	.00
2002	.00	8.78	6.44	80.6	2.04	.06	2.06	.02	.00	.00

Management Plans

Although the 2002 year class appears to be moderate the regulations of a 20,000 pound commercial fishery and a daily bag limit of 10 for sport fishers will remain in effect until the Fall of 2004. Regulation changes will be looked into during 2003 – 2004 taking into consideration all new data collected. However, it is unlikely that more relaxed regulations will be put in place, as the 1998 year class is decreasing in number and the 2002 year class is the only moderate year class that has been observed in Green Bay for five years.

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STATUS OF YELLOW PERCH STOCKS - LAKE MICHIGAN

Stringent harvest regulations are still in place in order to protect remaining adult yellow perch population in Wisconsin waters as well as lake-wide. Although 1998 year-class raised some hopes of rebounding, the recruitment of yellow perch following 1998 has been extremely minimal. This report is a summary of the status of young and adult perch in Lake Michigan assessed through several annual assessments in Wisconsin waters during 2002-03.

Seining

In southeastern Wisconsin, beach seining was done for young of the year (YOY) yellow perch at 14 sites between Kenosha and Sheboygan from August 19, 2002 to September 9, 2002 using a 25' bag seine. The bag-seine was found to be an effective gear in this area due to uneven bottom and hard substrate not conducive for trawling. Conditions were reasonably good in most sites. However, some of the sites were modified due to lowered lake water level. Surface water temperature ranged from 51 ^{0}F to 77 ^{0}F. Catch per effort (CPE) is calculated as the mean number of YOY perch per 100ft seine haul. This number is used as an index of year-class strength. Figure 1 shows the catch per effort of YOY yellow perch for the sites in the Southeast Region (SER) since 1989. No YOY yellow perch were captured in 1994 sampling as well as 1999 sampling. In our 2002 survey, 21 fish species were identified. A total of 67 YOY yellow perch with an overall CPE of 1.28, which indicates another year of poor reproductive success, yet an improvement over 2001. The size range of YOY yellow perch was 50 mm to 67 mm. By and large, YOY alewife dominated the catch followed by spottail shiner and longnose dace.

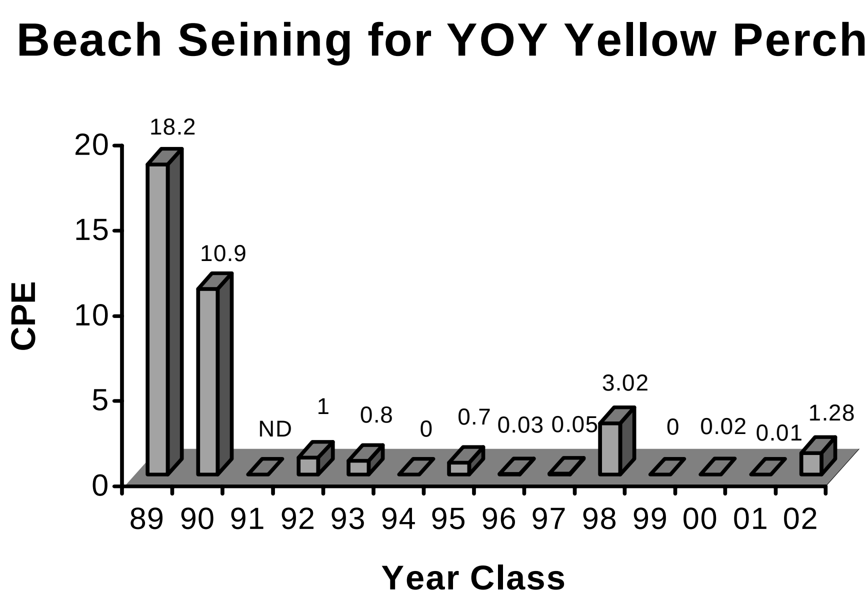

Figure 1. CPE (fish per 100' seine haul) in summer beach seining.

In addition to using a standard bag seine, in 2002, a modified Swedish monofilament gill net was used to capture YOY yellow perch in the nearshore waters. The net consisted of four panels, each 10ft long and 5 ft deep, with varying mesh sizes – 6.25mm, 8mm, 10mm and 12mm. Two similar nets were set in the same general area of seining, one on sandy bottom and the other on rocky bottom in approximately 8-20ft of water. The nets were allowed to fish for one night. During the 2002 sampling season we lifted 18 gill nets at 11 sites and captured 52 YOY yellow perch. We did not see any pattern with regard to the substrate type. The catch per 100ft (CPE) of gill net worked out as 7.2. The majority of YOY yellow perch were captured in 6.25mm mesh. Spottail shiner was the dominant species in the gill catch followed by alewife and longnose dace.

Spawning Assessment

This assessment has been conducted on the Green Can Reef and in the Milwaukee harbor since 1990 (Table 1).

Table 1. Yellow perch spawning assessment in Milwaukee waters (Green Can Reef) of Lake Michigan - 1990-2001.

Year	Total	Males	Females	Sex-unknown	% Females	Total effort[1]
1990	2,212	1,922	290	1	13	19,200
1991	3,474	2,600	874	2	25	14,400
1992	7,798	5,242	2,556	1	33	14,400
1993	2,085	1,188	897	0	43	14,400
1994	401	330	71	0	18	9,600
1995	1,272	1,233	39	0	3	17,000[2]
1996	4,674	4,584	90	0	2	14,400
1997	14,474	14,417	46	11	0.32	5,000[3]
1998	4,514	4,283	231	0	5.1	24,600[4]
1999	5,867	5,635	232	0	4	9,200
2000	855	722	133	0	15.5	3,700
2001	1,431	993	438	0	31	5,400
2002	1,812	1,645	167	0	9.2	2,550

[1] effort = length of gill net in feet
[2] includes 7,000 feet of standard 2 1/2 " mesh commercial gill net
[3] in addition to this 5,000’ of commercial gill net, double-ended fyke nets were used
[4] in addition, 11 lifts of contracted commercial trap net and 4 lifts of fyke nets were used

The objective is to quantify the relative abundance of mature female perch in previously identified spawning areas. In 2002, we took first gillnet lift on 5/29/2001 at 35-65 ft. deep, and 1,376 (59 females) yellow perch were captured. The bottom water temperature was 48 ^{0}F. The majority of the yellow perch captured came from nets set at 36-45 ft. of water. At this time, 54% of females were green, 15% were ripe and 31% were ripe. The second lift was taken on 6/5/2002 when the water temperature was still 49 ^{0}F through out the water column. A total of 436 (108 females) yellow perch were captured. One of the objectives was to assist in Sea Grant funded research on early life study. We were able to obtain necessary biological data and provide sufficient number of spawning individuals (12 spawning females) to the research team. Females comprised 9 percent of the total catch.

Egg deposition survey was conducted by the WDNR dive team from 6/5/2002 to 6/12/2002. A total of 573 egg masses were recorded in 49,701 m^2 (11.53 egg mass per 1000 m^2) area. This density is much higher than 2001 data (7.29 egg mass per 1000 m^2).

Graded Mesh Gill Net Assessment

The WDNR conducts standardized graded mesh gill net assessments annually in the winter, in grids 1901 and 1902 off Milwaukee. The mesh sizes used in these assessments run from 1 to 3 inches stretch on 1/4 inch increments. Yellow perch begin to recruit to this assessment gear by age 2 and are fully recruited by age 3. A total of five lifts, four with 2800' and one lift with 4200' were taken in December 2002 (12/5, 12/10, 12/11 and 12/12) and February 20, 2003 at depth ranges from 30' to 75'.

Table 2 shows the relative abundance as catch per effort of perch, by age, for this assessment from 1989 through 2003. The data show variability in catch rates by calendar year. These data show very low CPEs of older fish and higher CPEs of younger fish until the late 80s. Almost the entire 90s had very low numbers of age 3 and under, while the population was skewed toward older male perch. However, data on age and size distribution of yellow perch from 1999 onward represented smaller and younger perch (ages 2 to 4) in significant proportions, essentially from 1998 year-class (Table 2). The proportion of age 5 and older perch has been extremely reduced (Figure 2). This was probably due to a combination of poor recruitment and mortality of older fish. The fast growing 1998 year-class seems to have recruited to the fishery at the end of age 2. Once again, poor reproduction since 1998 is showing up as extremely weak year-classes. However, since 1999 the sex ratio of the yellow perch population has shifted toward predominantly female, influenced by the 1998 year-class. The overall catch comprised 91% of age 5 yellow perch. The 1998 year-class yellow perch appear to be disappearing from the population very fast due to targeted harvest.

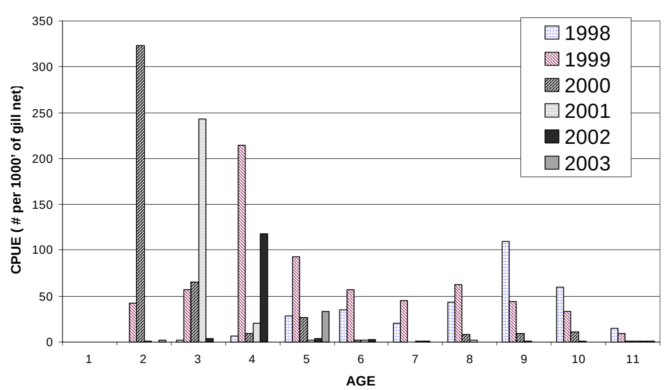

Figure 2. Catch-at-age in graded mesh gill nets during 1998-2003

Table 2. Catch per Effort (fish/1000ft./night), and the percent of each sex, of yellow perch caught in standardized assessment graded mesh gill net sets conducted in January each year, WDNR, Lake Michigan Work Unit.

Age	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	626	724	159	49	60	0	0	0	0	0	42	323	1	0	2
3	1854	1037	865	276	98	25	0	0	4	2	57	65	243	4	0
4	1012	938	323	715	402	58	28	0	14	6	215	9	20	118	0
5	1563	394	327	281	757	218	65	0	11	29	93	27	2	4	33
6	1880	381	83	181	165	141	120	19	18	35	57	2	2	3	0
7	155	90	82	126	49	48	76	51	77	20	45	0	1	1	0
8	1	0	32	73	16	11	65	71	251	43	63	8	2	0	0
9	0	0	0	14	0	0	24	31	109	110	44	9	1	0	0
10	0	0	0	0	0	0	2	12	15	60	33	11	1	0	0
11	0	0	0	0	0	0	0	3	0	15	9	1	1	1	0
12	0	0	0	0	0	0	0	0	0	4	7	0	0	1	1
%Male	69	61	72	82	86	89	90	95	89	80	58	36	36	38	52
%Female	31	39	28	18	14	11	10	5	11	20	42	64	64	62	48

Note: Aging of yellow perch changed from scales to spines starting in 2000 to be consistent with Green Bay methodology.

Harvest

In September 1996, the commercial yellow perch fishery was closed in the Wisconsin waters of Lake Michigan. Hence, the information on commercial harvest is limited up to 1995 catches. Sport harvest is monitored by a contact creel survey. The sport bag limit has been reduced to 5 fish/day in recent years, which is reflected in the total harvest (Table 3). Our creel survey data on the sport caught yellow perch indicated that the majority of catch consisted of a single year-class. The 1998 year-class dominated the sport harvest in 2001 representing 86.5% of the catch. Similar trend is evident from the 2003 winter graded mesh assessment that the1998 year-class comprised 91% of the catch. Overall sport harvest has decreased significantly in 2002 producing only 98,000 yellow perch compared to 134,000 in 2001. Because of the decreased density, the perch seem to be growing at a faster rate and attaining larger size at age, and hence the larger individuals in the angler harvest. This has caused some concern in both sportfishing community as well as the biologist that the adult perch may be getting removed from the population before they had a chance to spawn.

Table 3. Commercial and sport harvests during 1986-2002.

	Commercial harvest (lb. x 1000)	Sport harvest (number x 1000)
1986	373	411
1987	550	639
1988	431	932
1989	267	719
1990	256	649
1991	326	887
1992	282	960
1993	267	546
1994	254	290
1995	128	247
1996	15[a]	95[b]
1997	closed	31[b]
1998	closed	38[b]
1999	closed	34[b]
2000	Closed	75[b]
2001	Closed	134[b]
2002	Closed	98[b]

[a] commercial yellow perch fishery was closed effective September 1996
[b] sport bag limit was reduced to 5/day effective September 1996
(Note: Sport harvest data includes Moored boat catch since 1989)

Management Actions

All yellow perch assessments and harvest data from the Wisconsin waters of Lake Michigan show weak year classes beginning with the 1990 year class. However, 1998 year class was the strongest yearclass in recent which supporting the fishery. These observations are consistent with data collected by other agencies throughout the lake. Effective September 1996 commercial fishing was closed in the Wisconsin waters of Lake Michigan and daily sport bag limit was reduced to 5 fish with the closed season from May 1 to June 15. These rule changes are implemented to benefit the perch population by reducing impact on spawning stocks. Recently, sport fishery has been dominated by a single year-class of 1998, which grew faster and attained larger size. However, the harvest declined markedly from 2001 to 2002 indicating this yearclass can only support the fishery for so long. Even the catches from 2003 winter graded mesh assessment are all time low. The conditions in the lake and weather pattern may have implications in the lower catches in the assessment gill net. But, one yearclass can only hold so long. We haven't seen sizable recruitment into the fishery since 1998. The yellow perch population in Wisconsin waters of Lake Michigan needs serious attention.

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NEARSHORE RAINBOW TROUT STOCKING EXPERIMENT

There is a strong public demand for nearshore fishing opportunities on Lake Michigan. Nearshore fishing opportunities for Lake Michigan trout and salmon have declined since the late 1980's due to changes in species or strains stocked, reduction in the Lake Michigan forage base or perhaps from clearer water nearshore making trout and salmon more difficult to catch. With reduced yellow perch abundance and salmon and trout moving farther offshore, anglers have requested the Wisconsin DNR to evaluate the stocking of rainbow trout to increase nearshore fishing opportunities. After receiving input on the project, Arlee strain rainbow trout were selected for the experimental study.

The ports of Kenosha, Milwaukee, Sheboygan, Manitowoc, Algoma and Sister Bay each received a stocking of 12,000 Arlee in the spring of 2001. When stocked, the Adipose-Left Pectoral (ALP) clipped fish averaged 174 mm in length and 55.1 g in weight. In 2002, Manitowoc and Milwaukee each received a stocking of 7,500 Arlee. The Left Pectoral (LP) clipped fish were 170 mm in length and 54.5 g in weight when stocked.

In 2001, anglers harvested an estimated 1,324 Arlee (Table 1). Harvested Arlee ranged in length from 229 to 432 mm and averaged 330 mm in length. Anglers fishing from piers or along the shoreline harvested most of the Arlee that were caught in 2001.

Table 1. The estimated 2001 and 2002 sport harvest of Arlee Rainbow Trout from the Wisconsin waters of Lake Michigan by fishery type.

Fishery Type	Estimated Total 2001 Harvest	% of Total 2001 Arlee Harvest	Estimated Total 2002 Harvest	% of Total 2002 Arlee Harvest
Boat	62	5%	1,259	78%
Pier/Shore	1,262	95%	285	18%
Stream	0	0.0%	61	4%
Total	1,324		1,605	

In 2002, it was estimated that anglers harvested 1,605 Arlee (Table 1). Most of the harvested fish (1,116 of 1,605) were from the 2002 stocking. These LP clipped fish averaged 566 mm in length and 1.7 kg in weight. The 2001 stocked Arlee were also harvested, but in much lower number. The ALP clipped fish averaged 547 mm in length and weighed 2.3 kg. Unlike 2001, the boat fishery took the majority of the harvested Arlee in 2002. Shore and pier anglers also harvested a substantial number of Arlee in 2002, but harvested fewer than in 2001. However, the harvest estimate and average length and weight must be viewed cautiously because of the small number of fish that had fin clips identified and that were measured and weighed.

The first two years of creel-survey data is encouraging and indicates that the Arlee rainbow trout may be benefiting nearshore anglers. The experimental stocking of Arlee rainbow trout will continue through 2004. In 2003, the Kamloops strain of rainbow trout will be added to the study to determine what strain provides the greatest fishing opportunities for nearshore anglers.

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